Extensible Access Control Framework for Cloud based Applications

User Manual for FGAC Policy Administration Point

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Contents

Introduction 3
Scope 3
Document Convention 4
A. System Learning 4
SL- 1: Manage Subject 4
SL- 2: Manage Resource 17
SL- 3: Manage Action 30
SL- 4: Manage Environment 43
B. Policy Creation: 57
PC - 1. Manage Target: 57
PC - 2. Manage Condition: 68
PC - 3. Manage Rule: 77
PC - 3. Manage Policy: 81
PC - 4. Manage Policy Set: 87
C. XACML Generation 92
PG - 1. Policy Generation 93
PG - 2. Policy Set Generation 96

Introduction

The purpose of this document is to provide *User Manual of Policy Administration Point (PAP) for Fine Grained Access Control (FGAC)* model for the project entitled *Extensible Access Control Framework for Cloud Based Applications.* This project broadly aims to provide *Access Control-as-a-Service (ACaaS)* for Software-as-a-Service (SaaS) layer applications. It incorporates variety of reliable and well-known access control models as Cloud based services. These access control models mainly include *Attribute Based Access Control (ABAC), Fine Grained Access Control (FGAC)* and *Usage based access CONtrol (UCON)* models. Each of these models is intended to facilitate the users to secure their applications at SaaS layer where the management and evaluation of access control decisions is externalized and handled for Cloud consumers. The major components of the framework include *Policy Decision Point (PDP), Policy Enforcement Point (PEP*) and *Policy Administrator Point (PAP*). All of these components are designed to perform some specific functionality, for-instance PAP, deals with the management of access control policy; whereas, PDP is responsible for the formulation of authorization decision by evaluating access control policy. However, PEP acts as a service gateway between PDP and the requested resource (application or service); it intercepts the authorization requests and forwards it to the PDP for decision making (permit/deny).

This manual briefly describes how FGAC policies are created using the PAP web interface. It further includes detailed screenshots illustrating each and every step that the user might take to complete different processes for all the main phases including 'System Learning', 'Policy Creation' and 'Policy Generation'. This manual is intended for system administrators, who may use this document as the guideline for the generation of access control policy.

Scope

This user manual is focused on FGAC model of the framework that elaborates the use of Policy Administration Point for creation and management of FGAC policies. It mainly focuses on three phases of the PAP which includes 'System Learning', 'Policy Creation' and 'Policy Generation'. The 'System Learning' phase includes the database population with the basic policy attribute which are Subject, Action, Resource and Environment. It provides a detailed guideline for a system administrator to add, delete or update the required attributes using i) Manage Subject, ii) Manage Action, iii) Manage Resource and iv) Manage Environment functions. The second phase for the PAP, namely 'Policy Creation', includes the creation of Target, Rule, Policy and PolicySet. In this regard, the document explains how to create, delete and update the 'Policy Creation' attribute. It provides step by step instructions for i) Manage Target, ii) Manage Condition iii) Manage Rule, iii) Manage Policy and iv) Manage PolicySet functions. Furthermore, it explains how to use the PAP interfaces for XACML Policy and PolicySet generation. FGAC brings granularity in the policies through the Rule attribute of XACML that is reflected in Manage Policy section of this document.

Document Convention

DC- 1: The core XACML tags are highlighted with Capital First Letter.

DC- 2: The PAP interface titles are specified with Capital First Letter and *Bold* font style

DC- 3: Names of main PAP phases are written in single quotes with Capital First Letter.

A. System Learning

In this section, we have demonstrated how to create, update and delete the Subject, Action, Resource and Environment attributes in 'System Learning' phase.

1. Select the **System Learning** option from the main interface of PAP as shown in below figure.

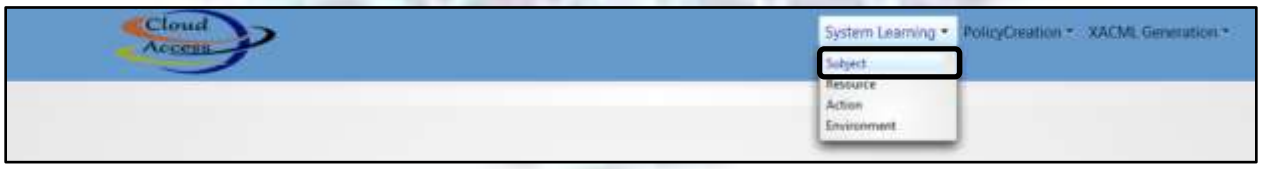
The **System Learning** interface displays the option for Subject, Action, Resource and Environment. Accordingly, the below subsection demonstrates the **Manage Subject**, **Manage Resource**, **Manage Action** and **Manage Environment**.

SL- 1: Manage Subject

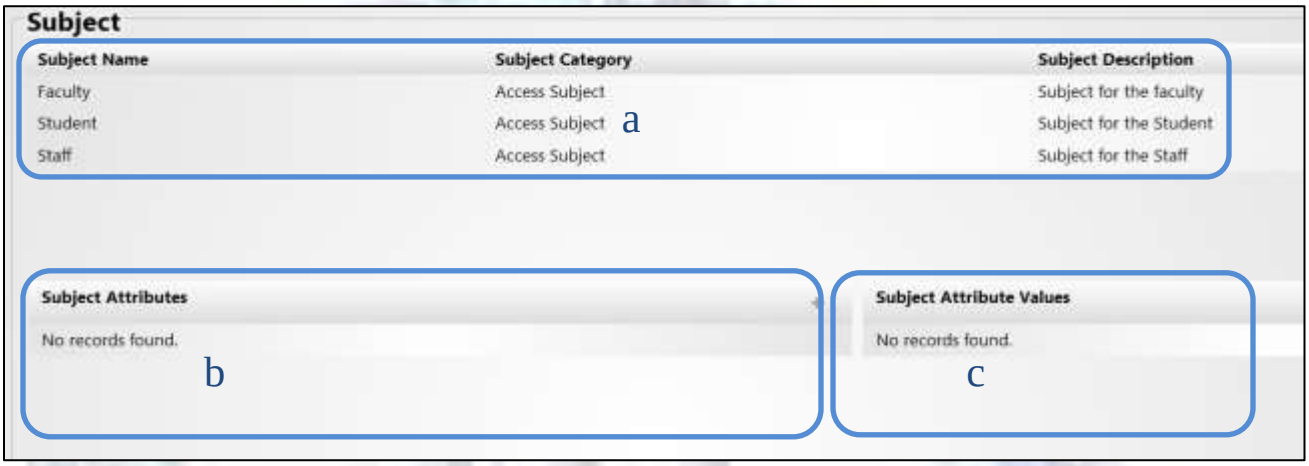
We demonstrate how the system administrator can create, update and delete the Subject in 'System Learning' phase. It further consists of three sections namely **Create Subject**, **Update Subject** and **Delete Subject**.

MS- 1: Create Subject

1. Select the **Subject** option from dropdown list as depicted below.

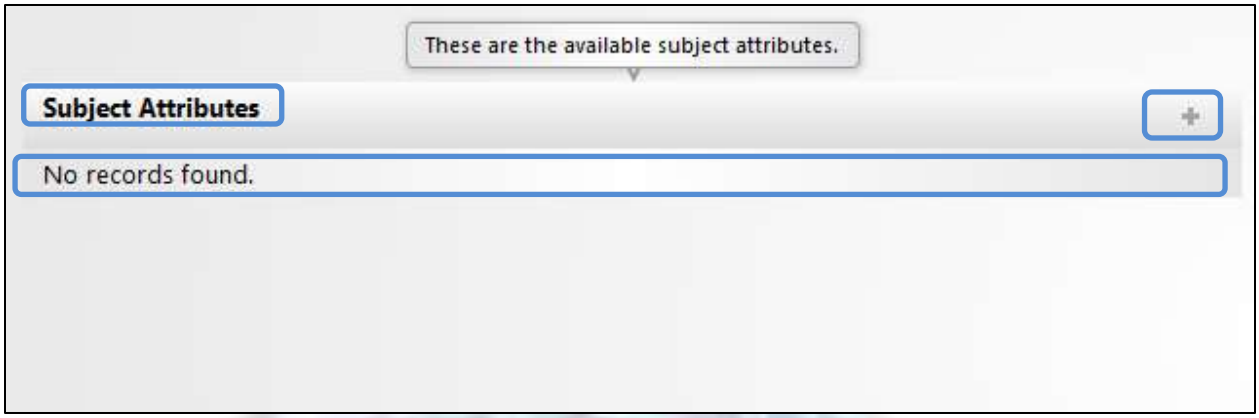


2. After selecting the **Subject** option in previous step, the following screen appears to add the new Subjects. This interface further includes three main portions as highlighted with "a", "b" and "c" in the below figure.

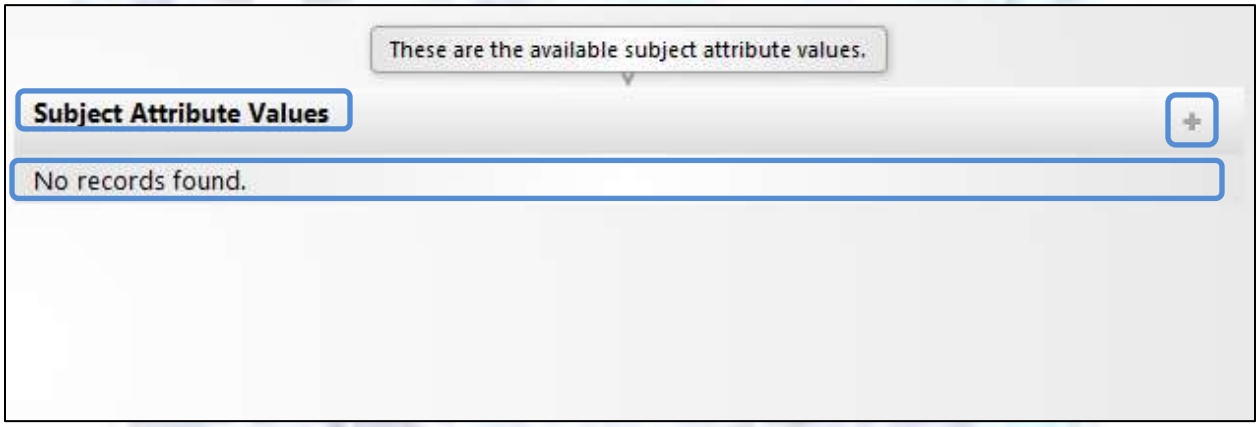


a) The upper portion of the **Subject** interface contains **Subject Name**, **Subject Category** and **Subject Description** columns. If there are no Subjects in the database, "*No records found*" appears, otherwise the table is populated with the existing Subjects of database.

b) The second portion of this interface contains the **Subject Attributes** tab that enlists the added attributes for a given Subject. Initially, there are no records in the database and the "+" button is also disabled.

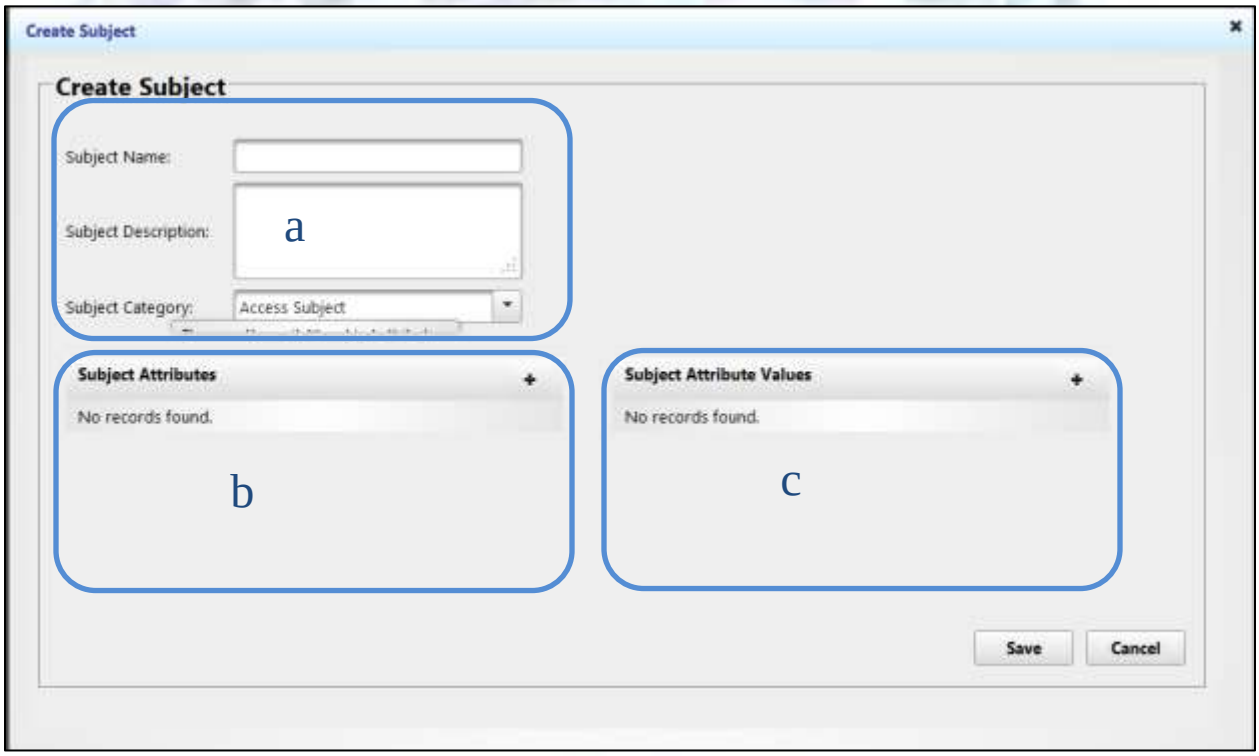


c) The third portion of the interface consists of **Subject Attribute Values** tab that gives a list of different values for a specific attribute. At the start, when no Subject, Attribute and Attribute Values are added, the "+" sign is disabled.

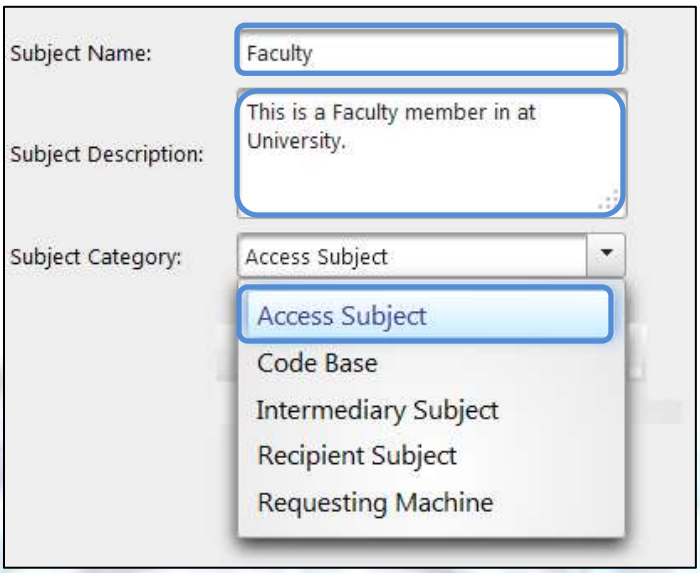


3. Click on the **Add Subject** button on the bottom right corner of the below interface.

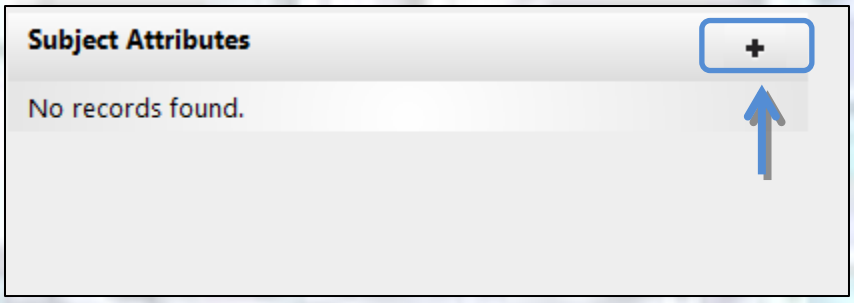
4. The **Create Subject** interface opens to add the required Subjects. This interface further has three main portions to add the Subject , Attributes and Attribute Values as highlighted with "a", "b" and "c" in below figure.



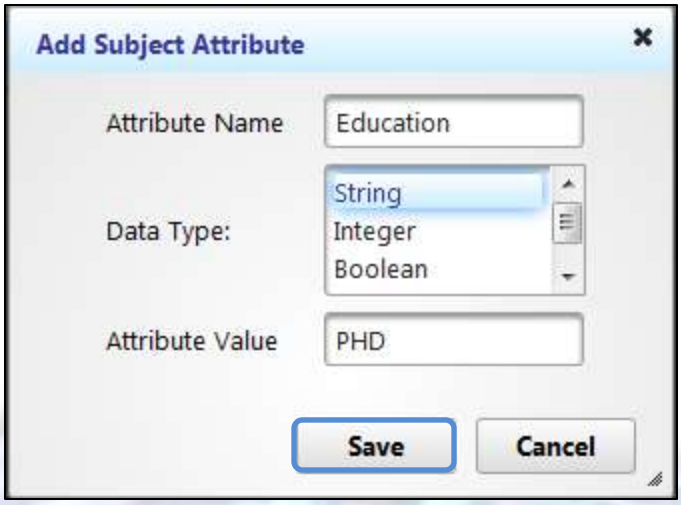
a- 1) The first portion of the interface consists of **Subject Name, Subject Description** and **Subject Category** text box. In order to create a Subject, add the required name and description in text boxes. The required category can be selected from the dropdown list as shown below.



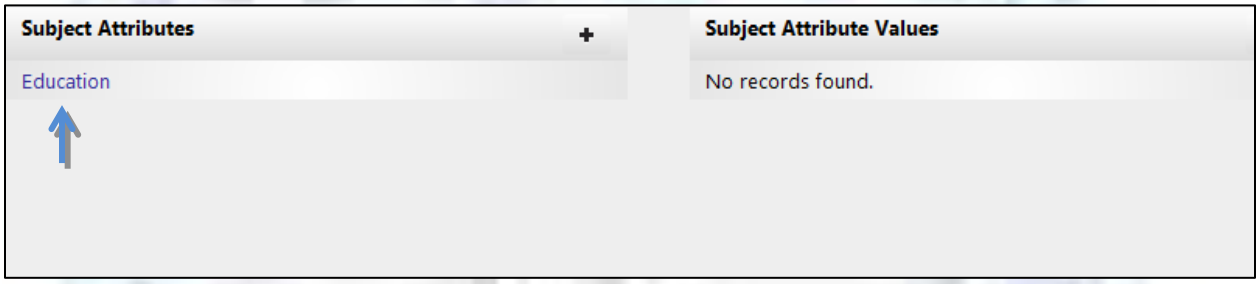
b-1) The second part of the **Create Subject** interface provides the **"+"** button to add the required attributes for a particular subject.



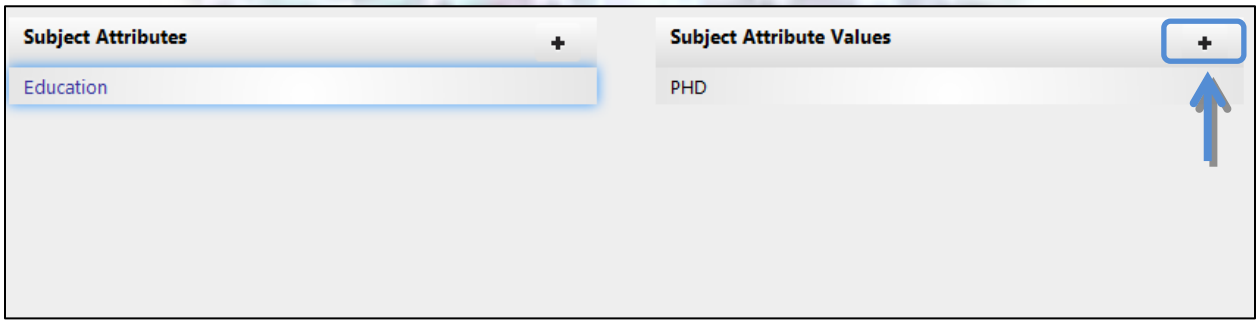
b-2) The following interface appears to add the required **Subject Attribute**. It consists of **Attribute Name**, **Data Type** and **Attribute Value** text boxes. Enter the required attribute name, its value and select the data type from the given list. Click on the **Save** button.



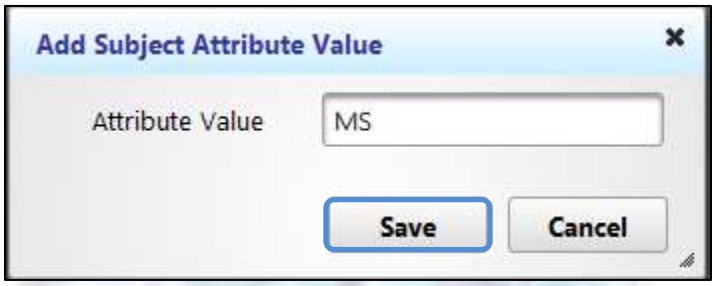
b-3) The added attribute is displayed under the **Subject Attribute** tab as shown in below figure.



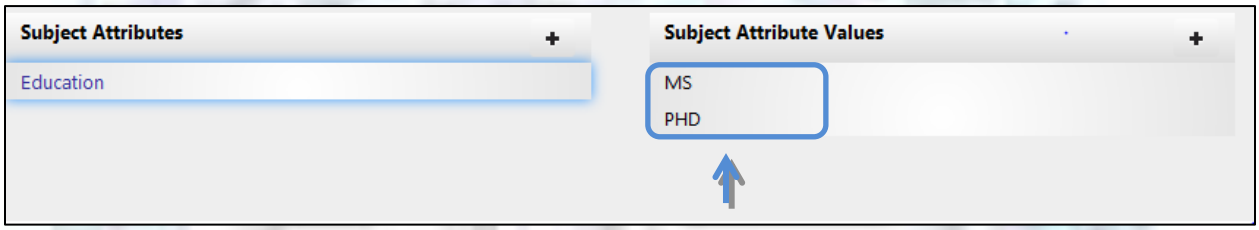
c- 1) The third portion of the **Create Subject** interface consists of the **Subject Attribute Value**s to add more than one value for specific attribute. It has a "+" button to add more values of the selected Attribute. If no Subject Attribute is selected then the warning message is displayed.



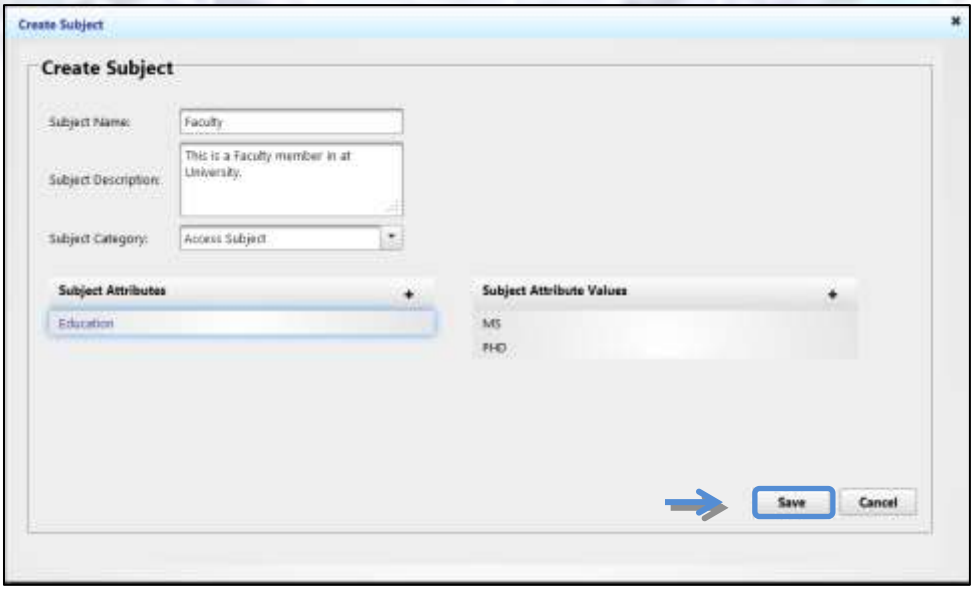
c- 2) When the "+" button is clicked the following window appears on the screen containing the **Attribute Value** text box. Enter the desired value and then click on **Save** button as depicted in below figure.



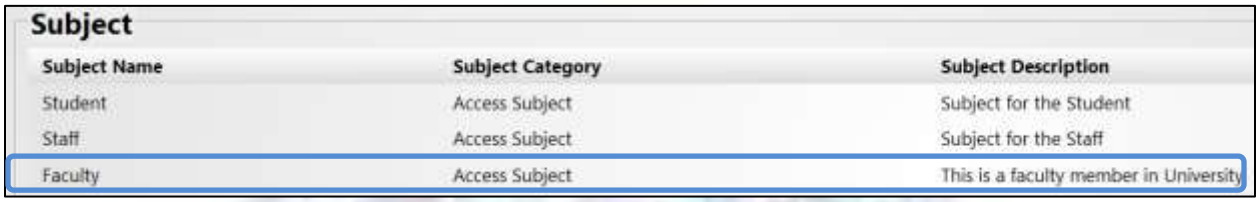
c- 3) After saving the Attribute Value, both, the newly added value and the previously existing value are visible under the **Subject Attribute Values** tab as shown in below figure.



5. Now click on the **Save** button in the **Create Subject** interface to save the added Subject in database.

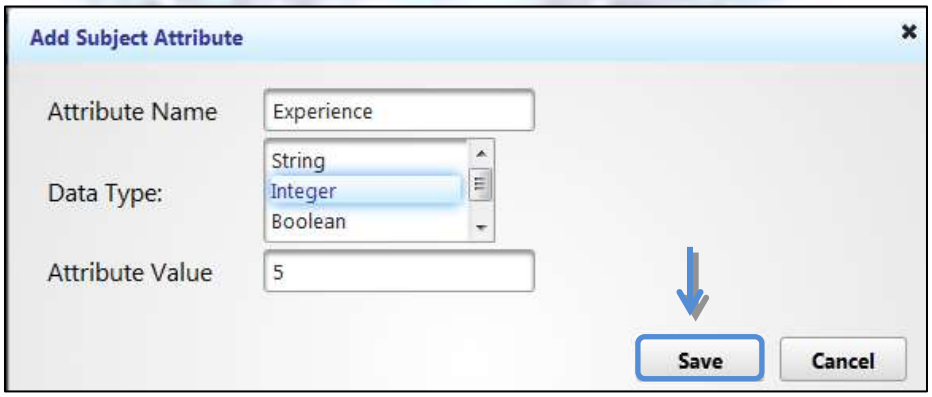


6. The added Subject is displayed on **Subject** interface with its values under the **Subject Name**, **Subject Category** and **Subject Description** tabs as given below.

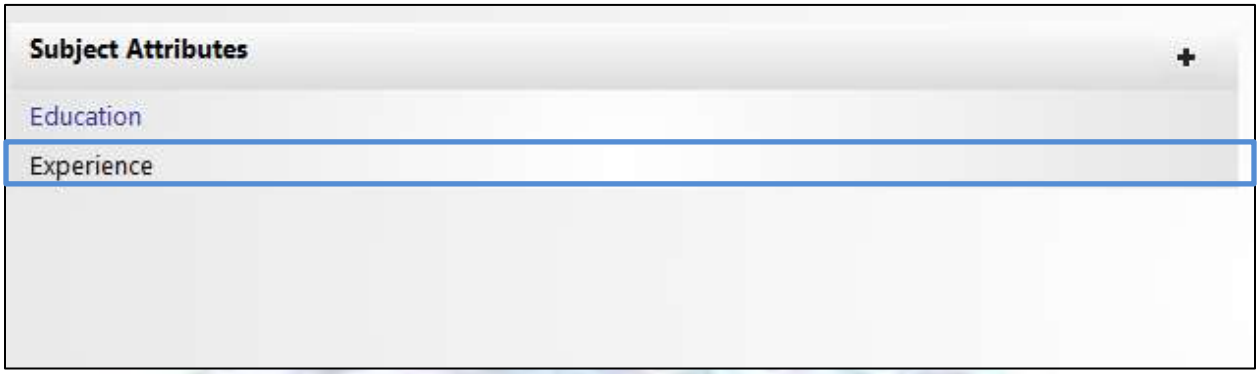


7. Now click on the newly added row of Subject, it gives the Attributes of the Subject under the **Subject Attribute** tab as well as the "+" sign is enabled to add more Attributes for the selected Subject.

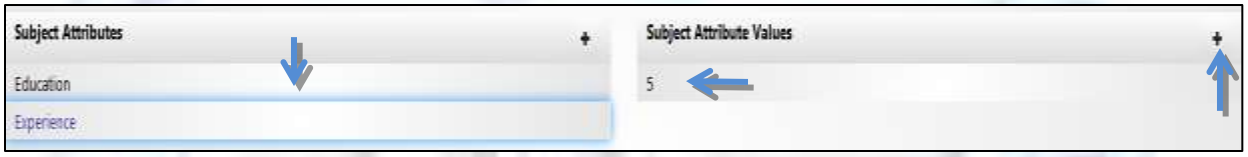
8. In order to add more Subject Attributes, click on the "+" button. Add the required values for **Attribute Name**, **Data Type** and **Attribute Value** and then click on **Save** button.



9. Now two Subject Attributes are visible under the **Subject Attribute** tab as shown below.

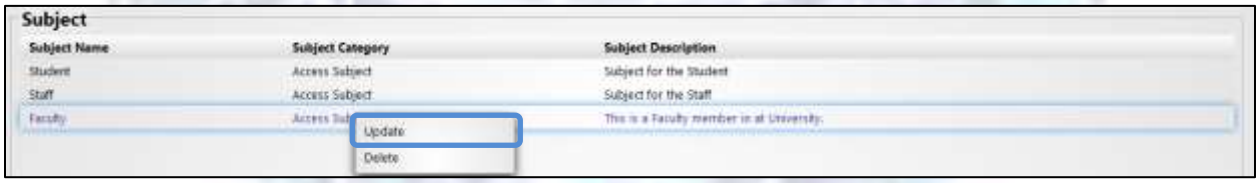


10. In order to view the values for specific Attributes, click on the required Attribute. It enables the "+" button as shown below. By clicking on "+" button more Attribute Values can be added to the selected Attribute.

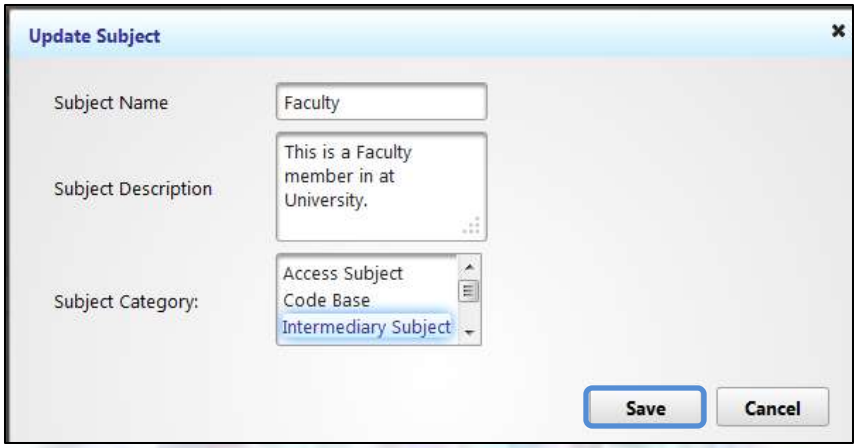


MS- 2: Update Subject

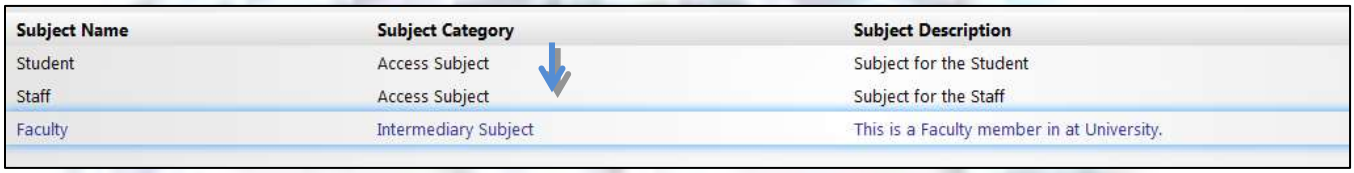
1. Right click on the specific Subject and then select the **Update** option form the menu as depicted in below figure.



2. The following interface appears after selecting the **Update** option in previous step. You can update any of the three values which include **Subject Name**, **Subject Description** or **Subject Category**. After updating the required fields, click on the **Save** button.

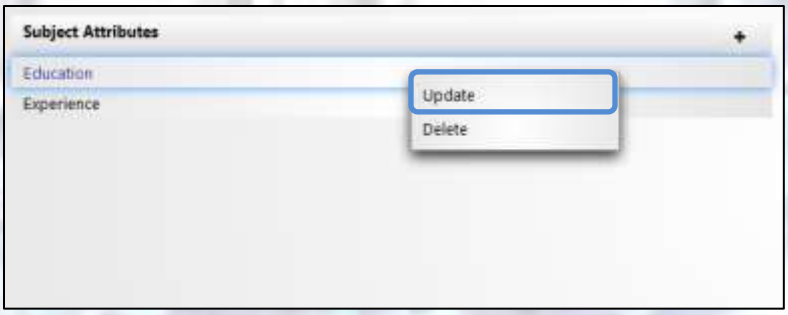


3. The updated results are visible on the main **Subject** interface as shown below.

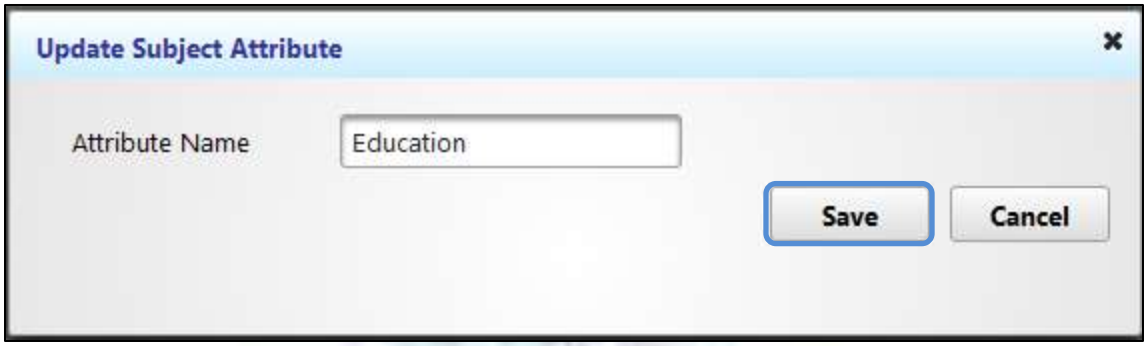


Subject Name	Subject Category	Subject Description
Student	Access Subject	Subject for the Student
Staff	Access Subject	Subject for the Staff
Faculty	Intermediary Subject	This is a Faculty member in at University.

4. Similarly, any Attribute of the Subject can also be updated. Right click on the required attribute under the **Subject Attribute** tab of **Subject** interface. A dropdown menu appears, select the **Update** option.



5. **Update Subject Attribute** interface displays on the screen. Enter the required name in the **Attribute Name** text box and click on **Save** button.



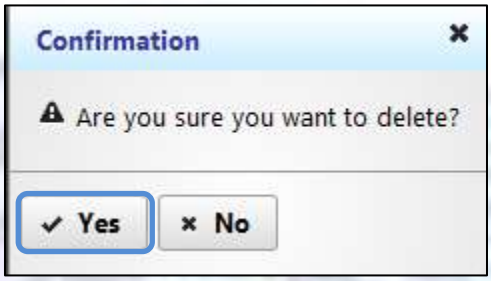
6. Similarly, the values for Attribute can also be updated. Right click on the name of the Attribute Value under **Subject Attribute Value** tab. Now select the **Update** option from the dropdown list.

7. The following window appears. Enter the new required value for Attribute and then click on **Save** button.

MS- 3: Delete Subject

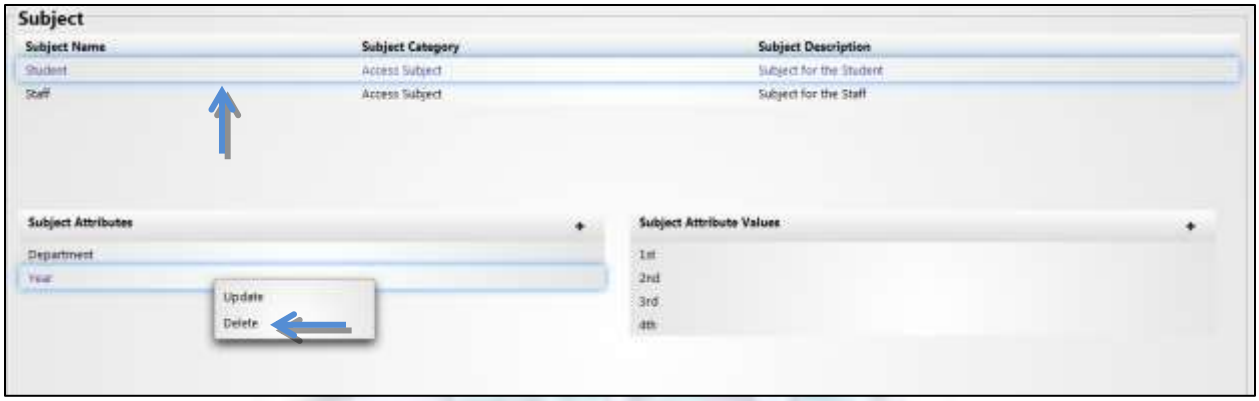
1. Right click on the name of Subject in main **Subject** interface. Select the **Delete** option from the dropdown list.

2. On selecting Delete, a confirmation Dialog box appears, click "**Yes**" to delete the desired Subject.

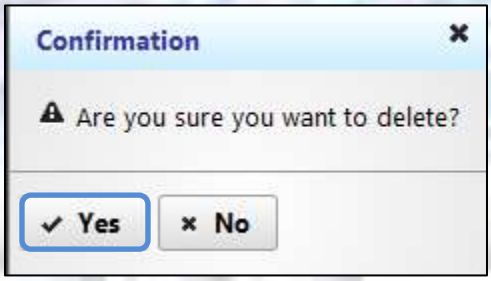


3. The selected Subject is deleted as shown in below figure. The **Subject Attributes** and **Subject Attribute Values** are also deleted for that specific Subject.

4. In order to delete a particular Subject Attribute of a Subject, select the subject and right click on Attribute desired to be deleted, under **Subject Attributes** tab on **Subject** interface. Click on the **Delete** option from the dropdown list.

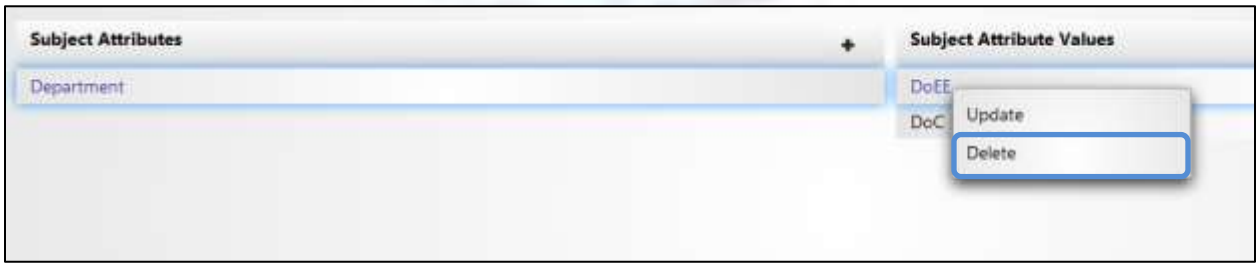


5. Confirm the decision by clicking on **Yes** in confirmation dialog box.

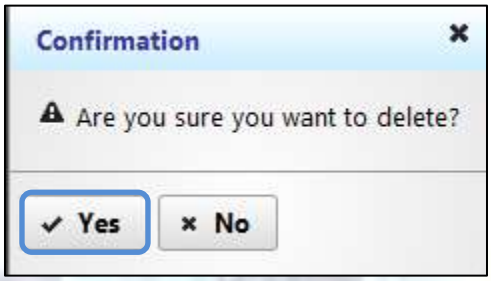


6. The selected Attribute is deleted along with all of its Attribute Values as shown in below figure.

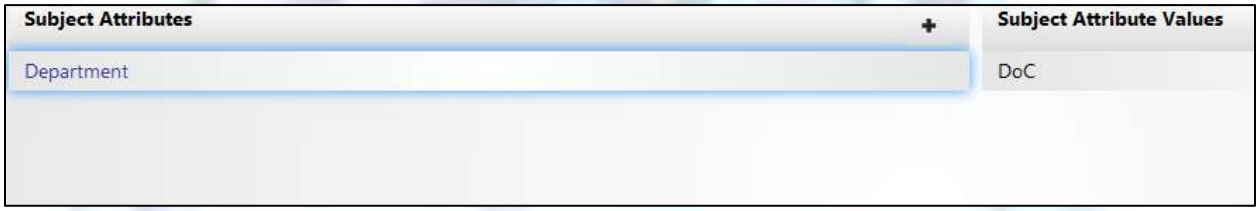
7. To delete a particular Attribute Value, right click on that value under the **Subject Attribute Value** tab and click on the **Delete** option.



8. Confirm the decision by selecting **Yes** in Confirmation dialog.



9. The selected Attribute value is deleted as depicted in below figure.

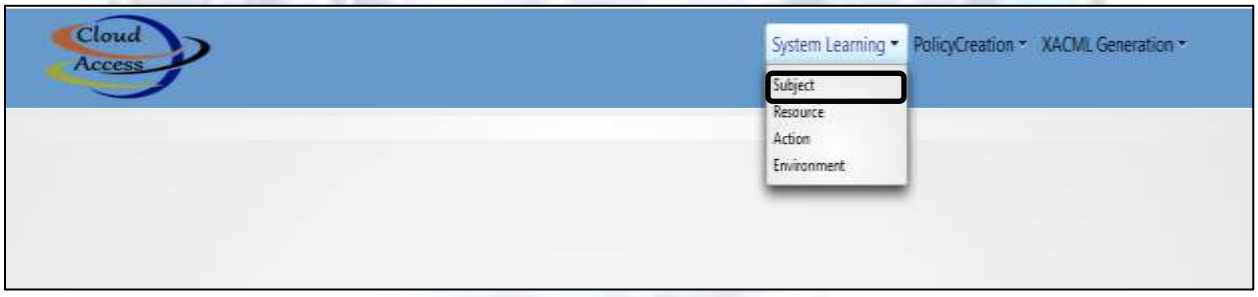


SL- 2: Manage Resource

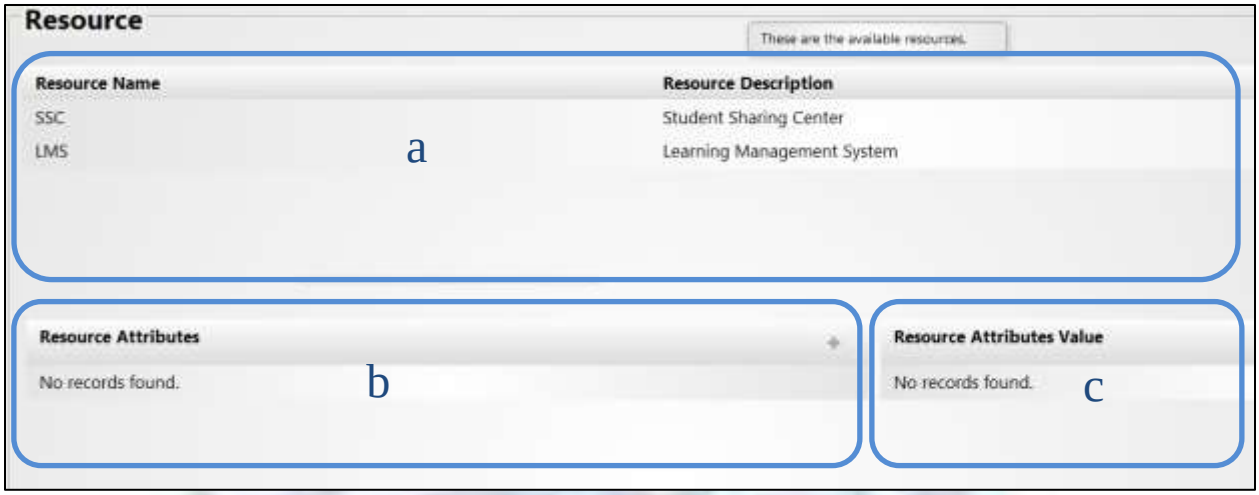
This section demonstrates how to create, update and delete the Resource in 'System Learning' phase.

MR- 1: Create Resource

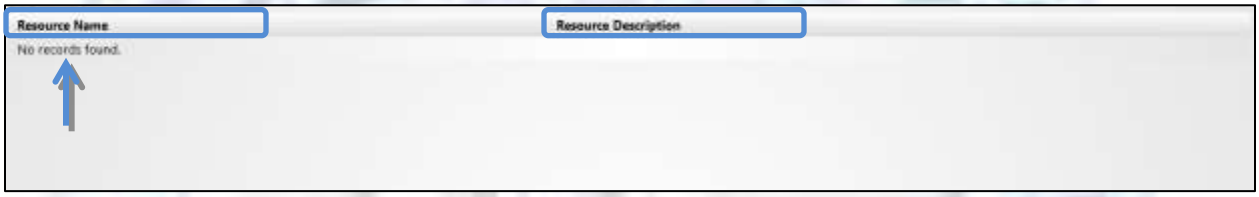
1. In order to create Resource, select the **Resource** option from dropdown list as depicted below.



2. After selecting the **Resource** option in previous step, the following **Resource** interface is displayed to add the new Resource. This interface further includes three main portions as highlighted with "a", "b" and "c" in the below figure.



a) The first part of the **Resource** interface contains **Resource Name** and **Resource Description** Columns.

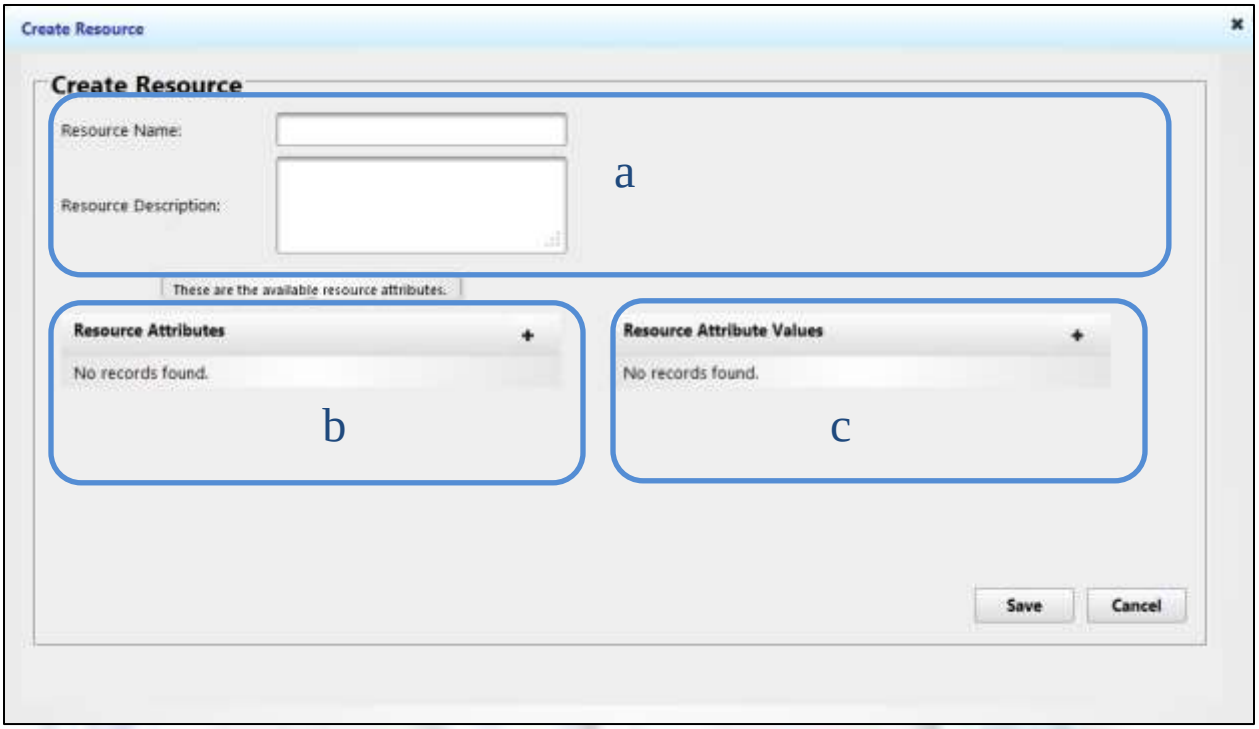


b) The second portion of this interface contains the **Resource Attributes** tab that enlists the added Attributes for a given Resource. Initially, when there are no records, the "+" button is disabled.

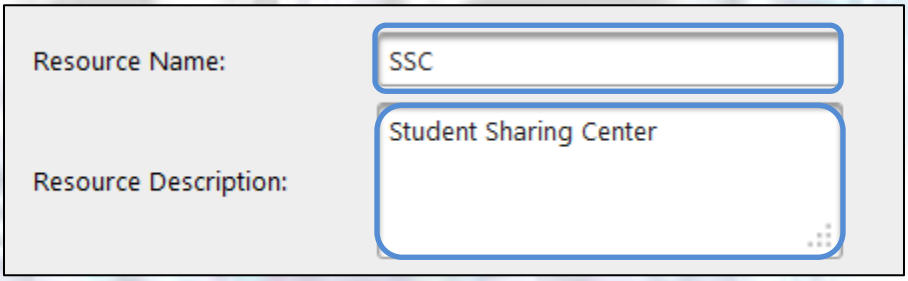
c) The third part of the interface consists of **Resource Attribute Values** tab that gives a list of different values for a specific Attribute. At the start, when no Resource, Attribute and Attribute Values are added, the "+" button is disabled.

3. Click on the **Add Resource** button on the bottom right corner of the below interface.

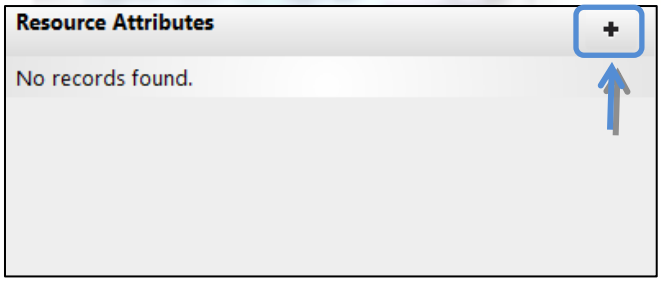
4. The **Create Resource** interface is opened to add the required number of Resources. This interface further has three main portions to add the Resource, Attributes and Attribute Values, as highlighted with “a”, “b” and “c” in below figure.



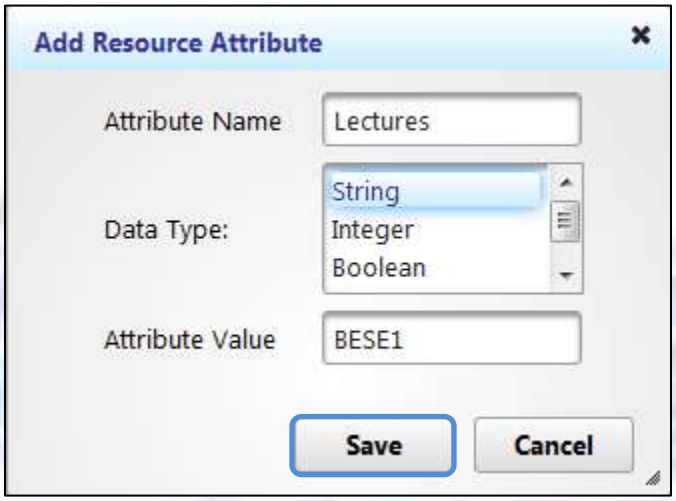
a) The first portion of the interface consists of **Resource Name** and **Resource Description** text boxes. In order to create a Resource, add the required name and description in text boxes.



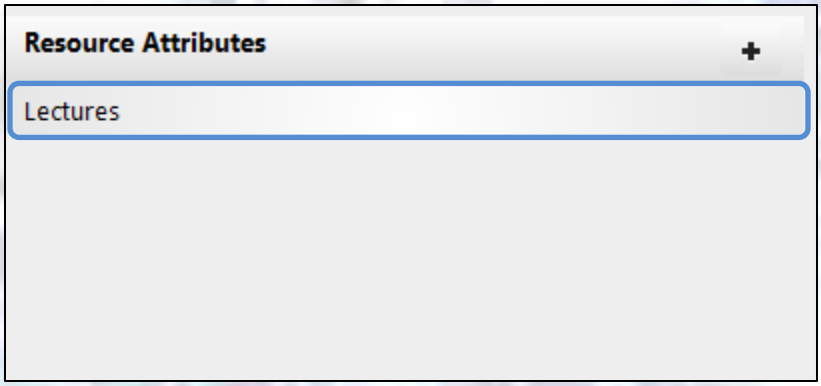
b-1) The second part of the **Create Resource** interface provides the **"+"** button to add the required Attributes for a particular Resource.



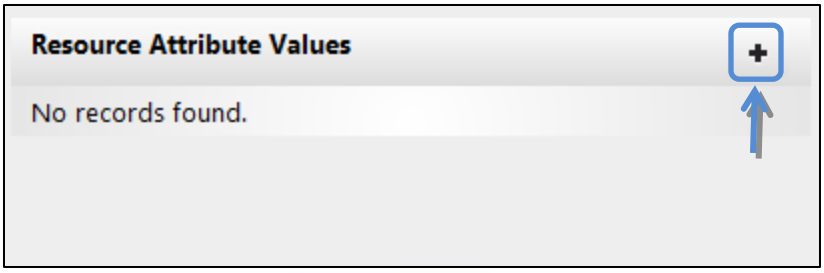
b-2) When the "+" is clicked, the following interface is displayed to add the required Resource Attributes. It consists of **Attribute Name**, **Data Type** and **Attribute Value** text boxes. Enter the required Attribute name, its value and select the data type from the given list. Finally click on the **Save** button as shown below.



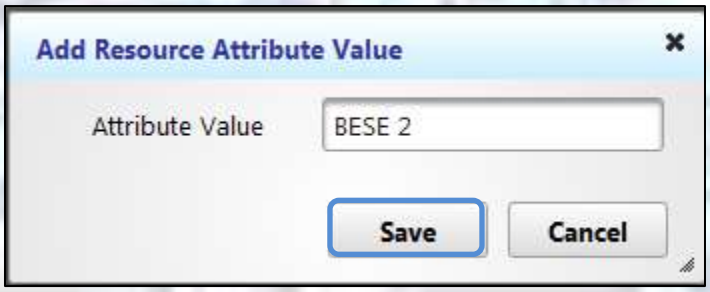
b-3) The added Attribute is displayed under the **Resource Attribute** tab as shown in below figure.



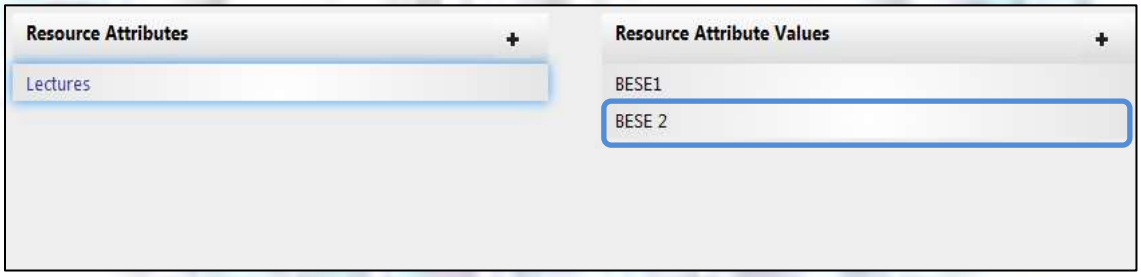
c- 1) The third part of the **Create Resource** interface consists of the **"+"** button to add more than one value for specific Attribute. It is compulsory to select the required Attribute from the **Resource Attributes** before adding the values. The warning message is displayed, if none of the **Resource Attributes** are selected.



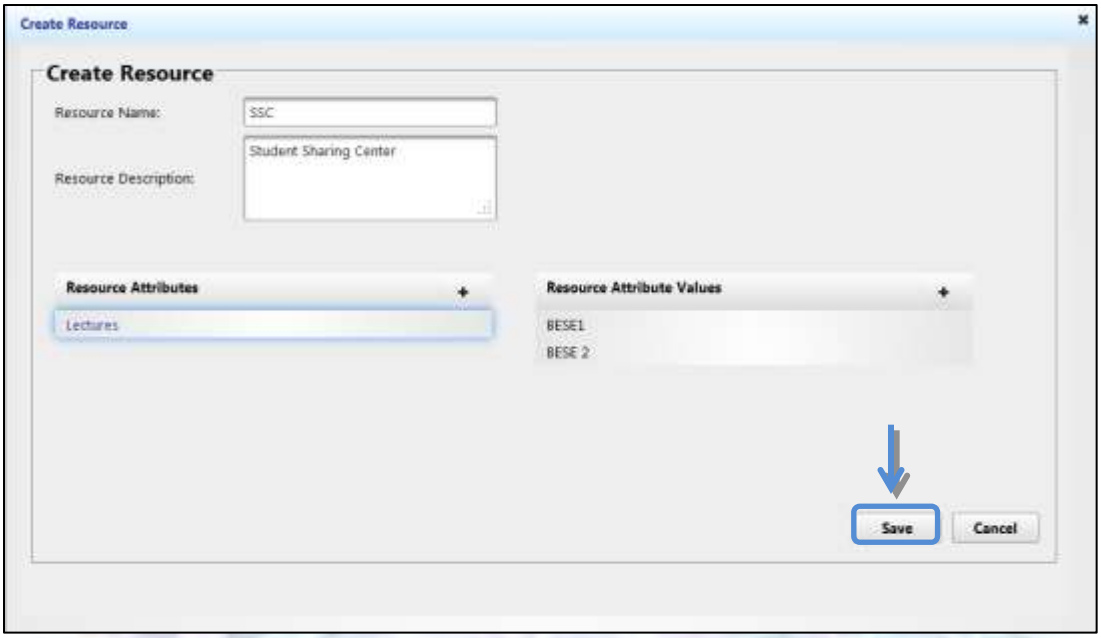
c- 2) Once the "+" button is clicked, the following window appears on the screen containing the **Attribute Value** text box. Enter the required value for Attribute and then click on **Save** button as shown in below figure.



c- 3) After saving the Attribute value, the following two values are visible under the **Resource Attribute Values** tab as shown in below figure.

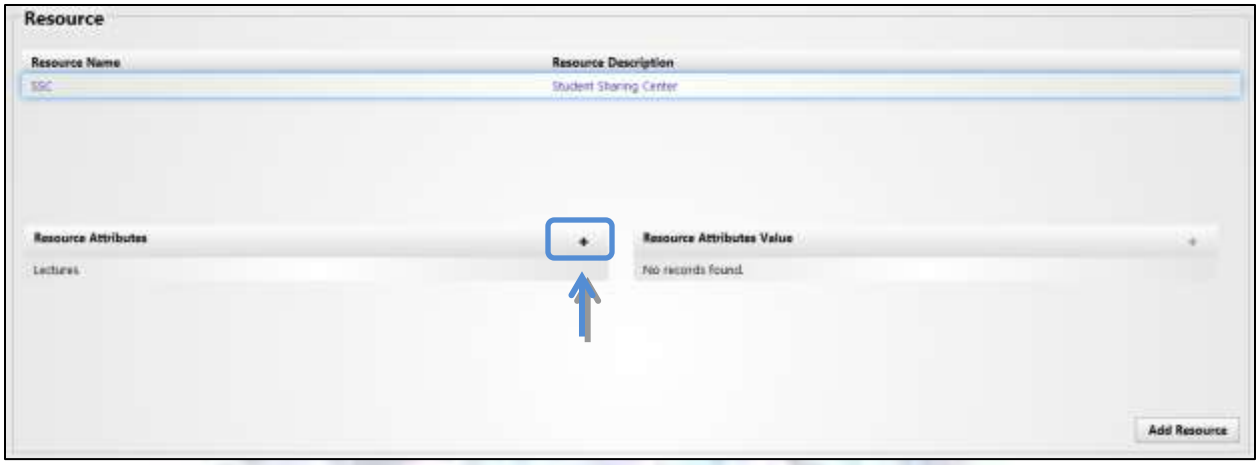


5. Now click on the **Save** button in the **Create Resource** interface to save the added Resource in database.

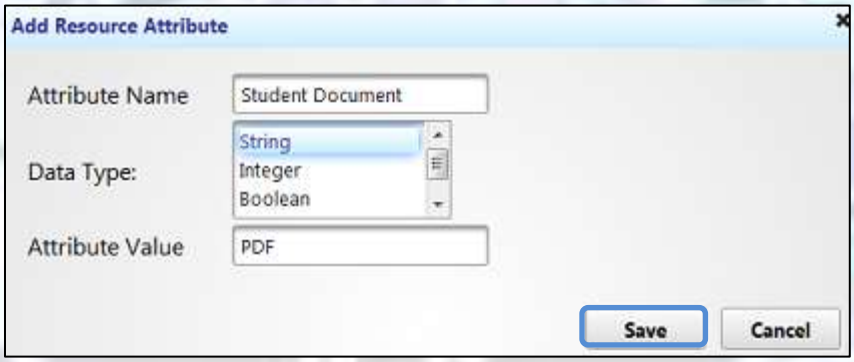


6. The added Resource is displayed on **Resource** interface with its values under the **Resource Name** and **Resource Description** tabs as shown in below figure.

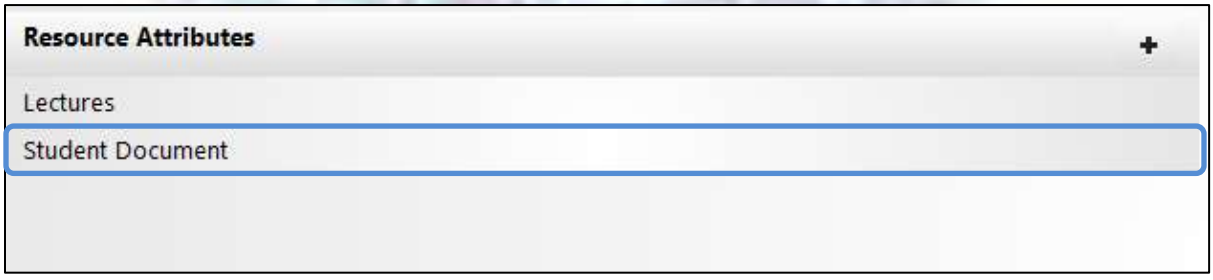
7. Click on the newly added row of Resource, it displays the Attributes of the Resource under the **Resource Attribute** tab as well as the "+" sign is also enabled to add more Attributes for the selected Resource.



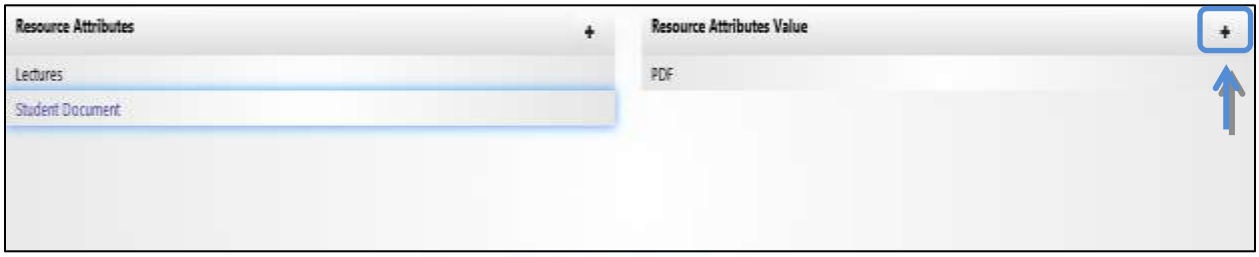
8. On clicking the "+" button following window appears, add the required values for **Attribute Name**, **Data Type** and **Attribute Value** and then click on **Save** button.



9. Now two different Resource Attributes are visible under the **Resource Attribute** tab as shown in figure below.

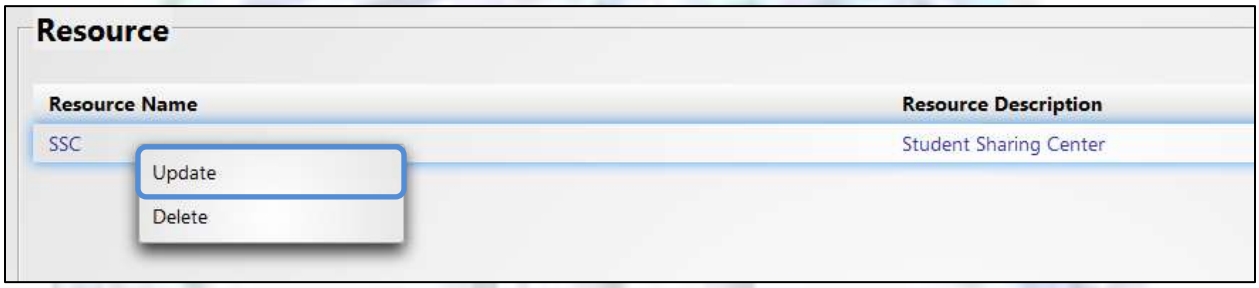


10. In order to view the values for specific Attributes, click on the required Attribute. It also enables the "+" button as shown below. By clicking on "+" button more Attribute Values can be added to the selected Attribute.

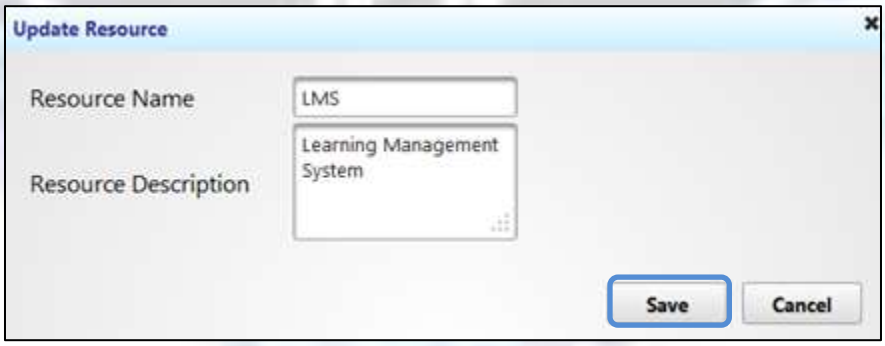


MR- 2: Update Resource

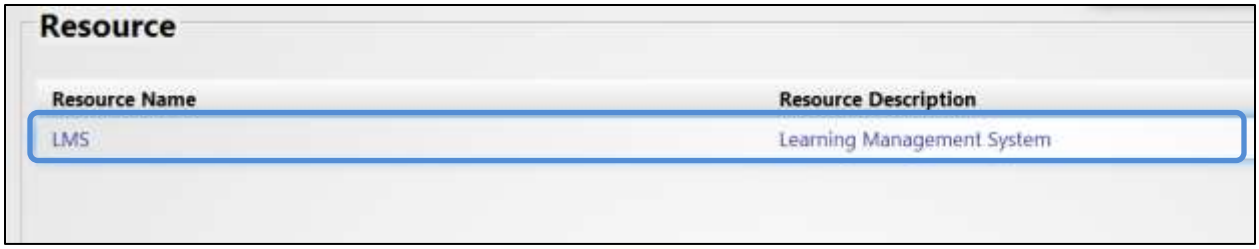
1. To update an added Resource, right click on that specific Resource in **Resource** interface and then select the **Update** option form the menu as depicted in below figure.



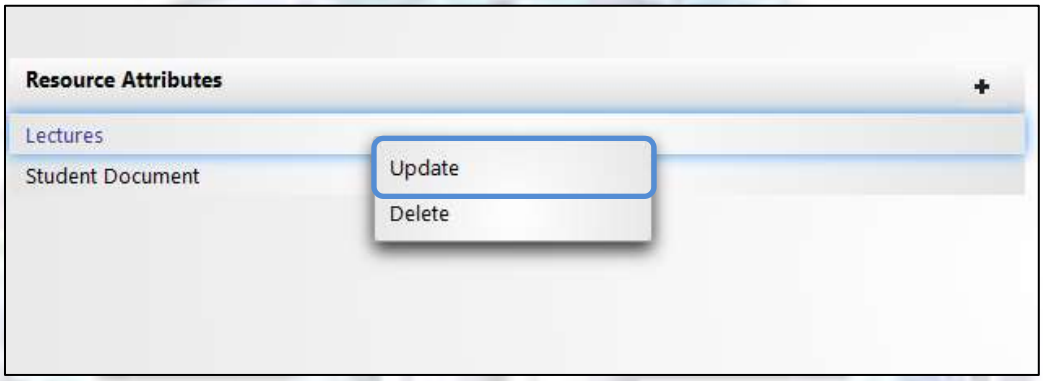
2. The following interface appears after selecting the **Update** option in previous step. You can update any of the two values which include **Resource Name** or **Resource Description**. After updating the required fields, click on the **Save** button.



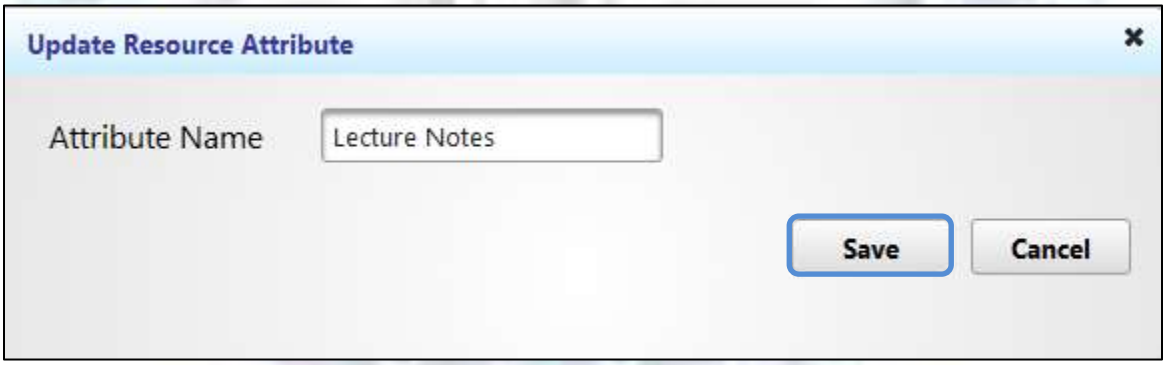
3. The updated results are visible on the main **Resource** interface as shown below.



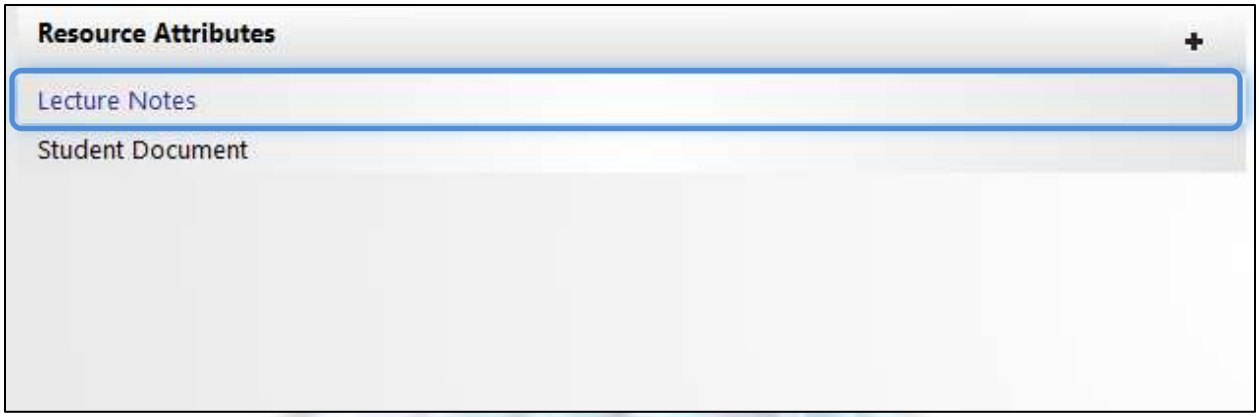
4. Similarly, any Attribute of the Resource can also be updated. Right click on the Attribute under the **Resource Attribute** tab of the main **Resource** interface. A menu appears and now select the **Update** option.



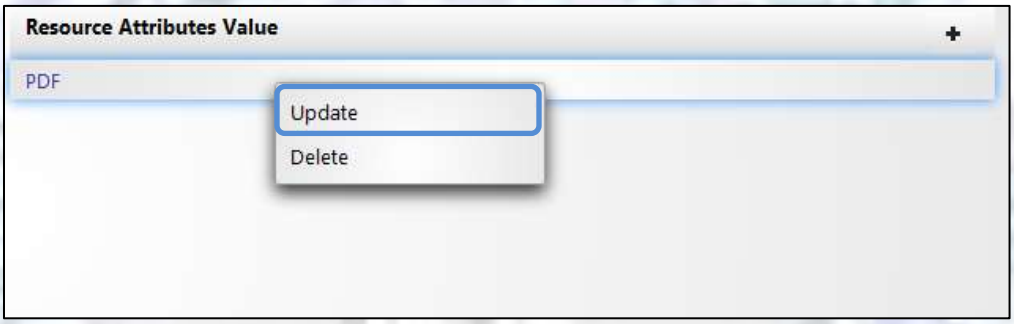
5. **Update Resource Attribute** interface is displayed on the screen. Enter the required name in the **Attribute Name** text box and click on **Save** button.



6. The updated results for the particular Attribute appears under the **Resource Attribute** tab on main **Resource** interface.

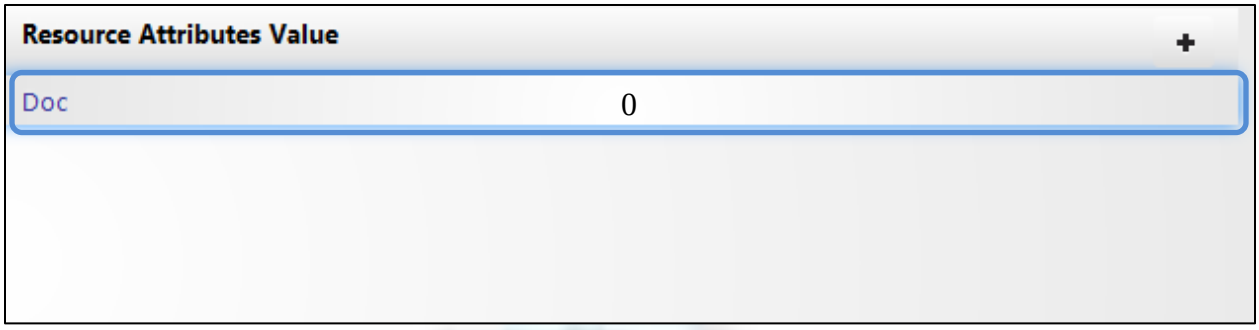


7. Similarly, the Values for Attribute can also be updated. Right click on the name of the Attribute Value under **Resource Attribute Value** tab. Now select the **Update** option from the dropdown list.



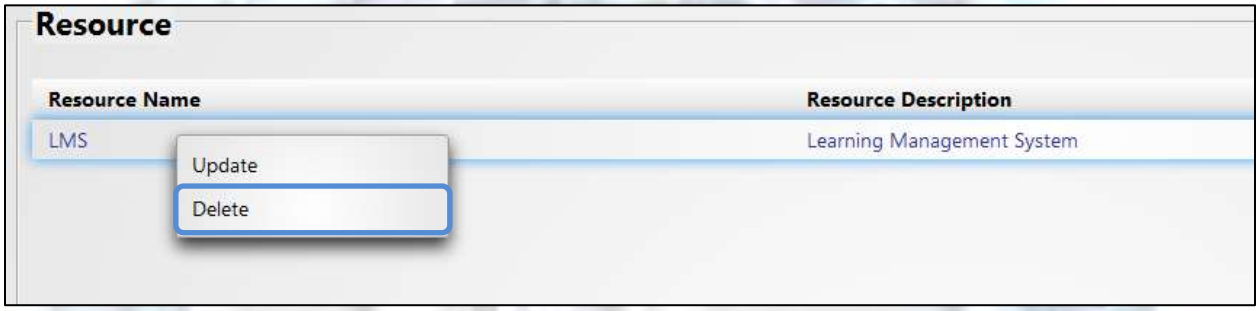
8. The following window is appeared. Enter the new required value for Attribute and then click on **Save** button.

9. The updated value for the Resource Attribute is displayed instead of the previous value as shown below.

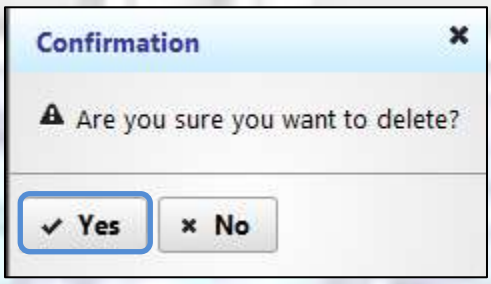


MR- 3: Delete Resource

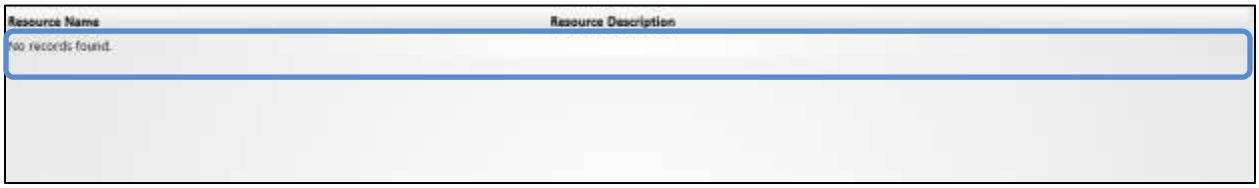
1. Right click on the name of that Resource in main **Resource** interface. Select the **Delete** option from the dropdown list.



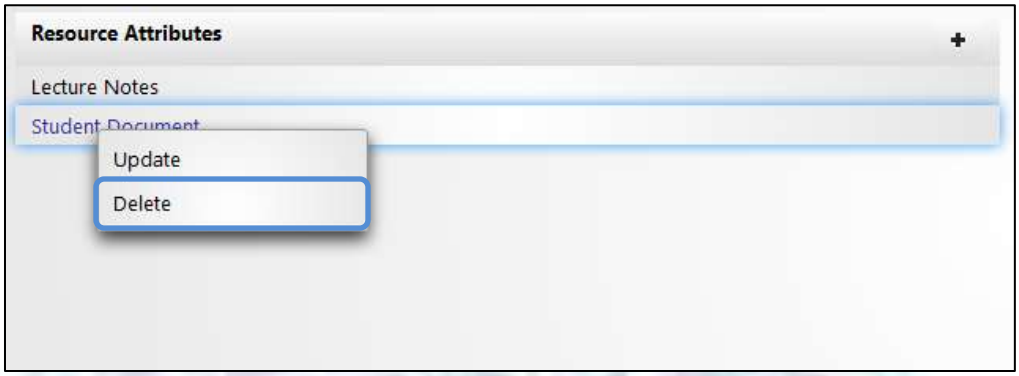
2. Confirm the deletion by clicking the **Yes** in the Delete confirmation dialog Box.



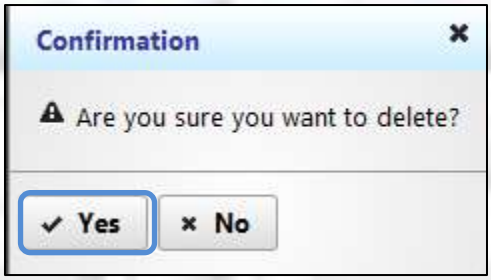
3. The selected Resource is deleted as shown in below figure. The **Resource Attributes** and **Resource Attribute Values** are also deleted for that specific Resource.



4. In order to delete an Attribute of particular Resource, right click on that Attribute under **Resource Attribute** tab on the main **Resource** interface. Click on the **Delete** option from the dropdown list.

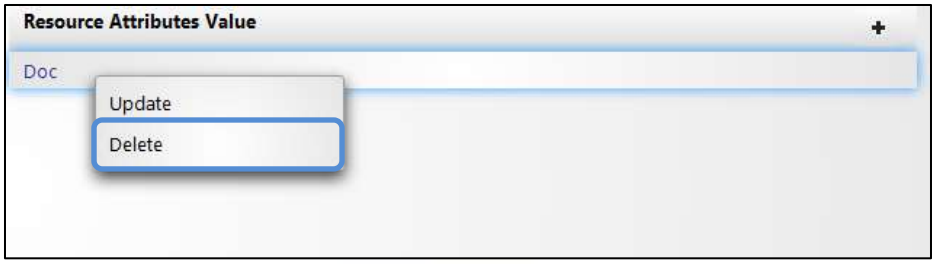


5. Click **Yes** to confirm the deletion in confirmation dialog box.

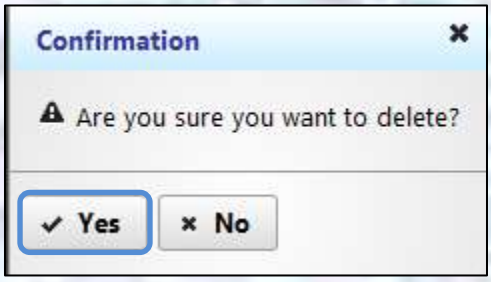


6. The selected Attribute is deleted along with all of its Attribute Values as shown in below figure.

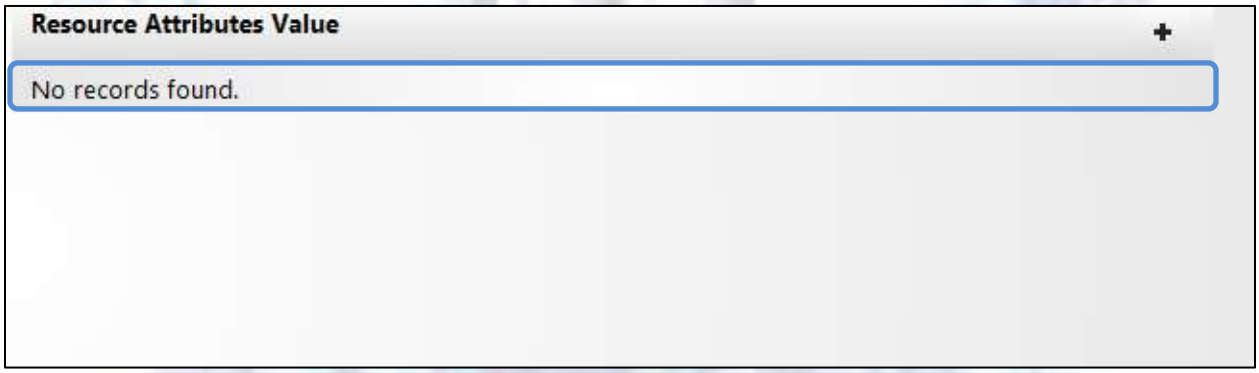
7. To delete a particular Attribute Value, right click on that value under the **Resource Attribute Value** tab and click on the **Delete** option.



8. Click **Yes** in the confirmation dialog box to confirm deletion.



9. The selected Attribute value is deleted as shown in below figure.



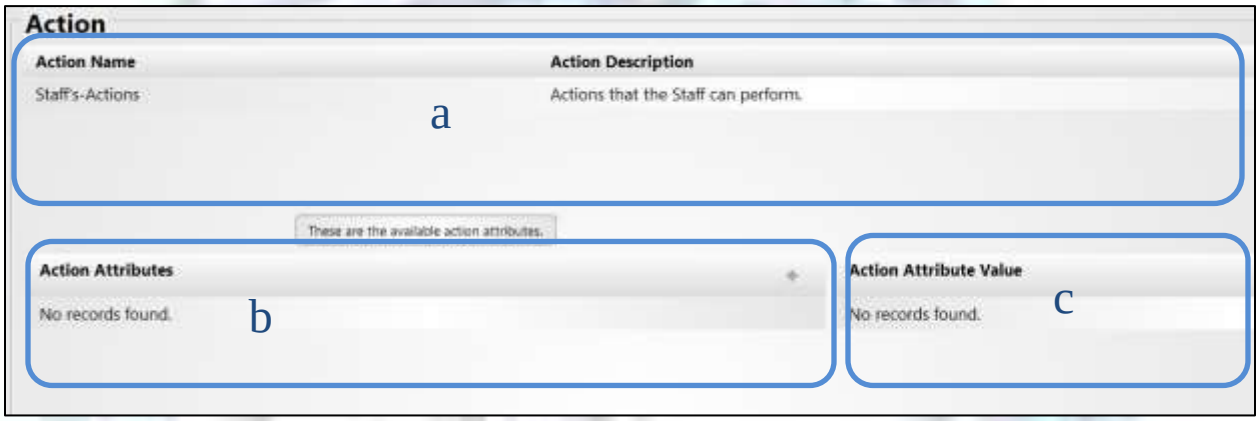
SL- 3: Manage Action

This section demonstrates how to create, update and delete the Action in 'System Learning' phase.

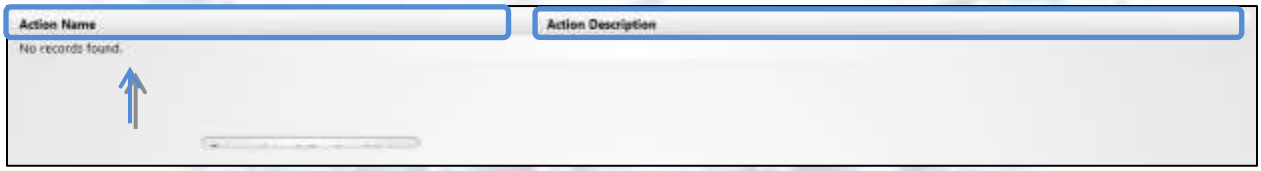
MA- 1: Create Action

1. In order to create Action, select the **Action** option from dropdown list as depicted below.

2. After selecting the **Action** option in previous step, the following **Action** interface is opened. This interface further includes three main portions as highlighted with "a", "b" and "c" in the below figure.



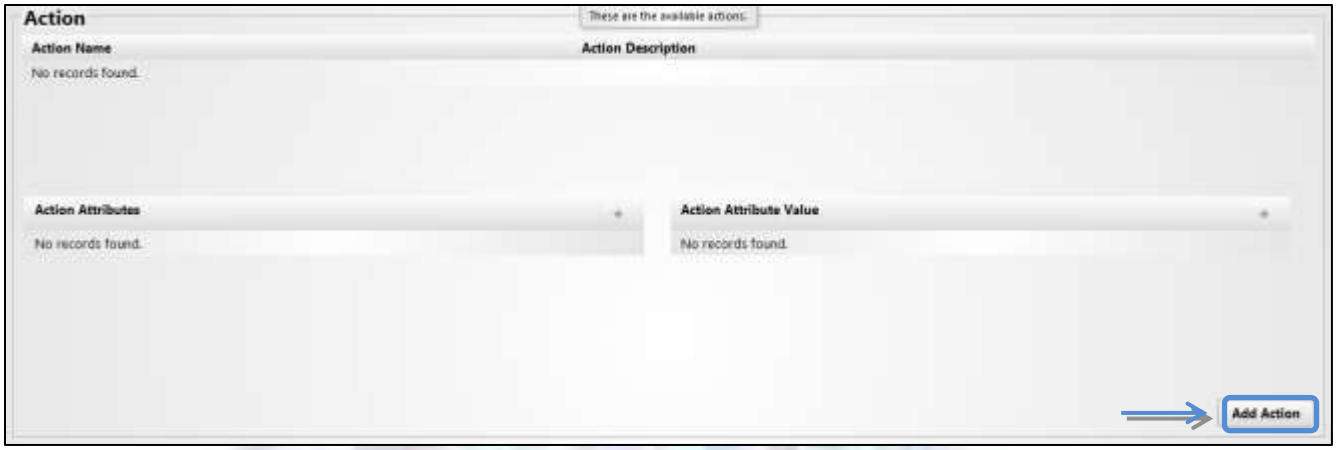
a) The upper portion of the **Action** interface contains **Action Name** and **Action Description** tabs.



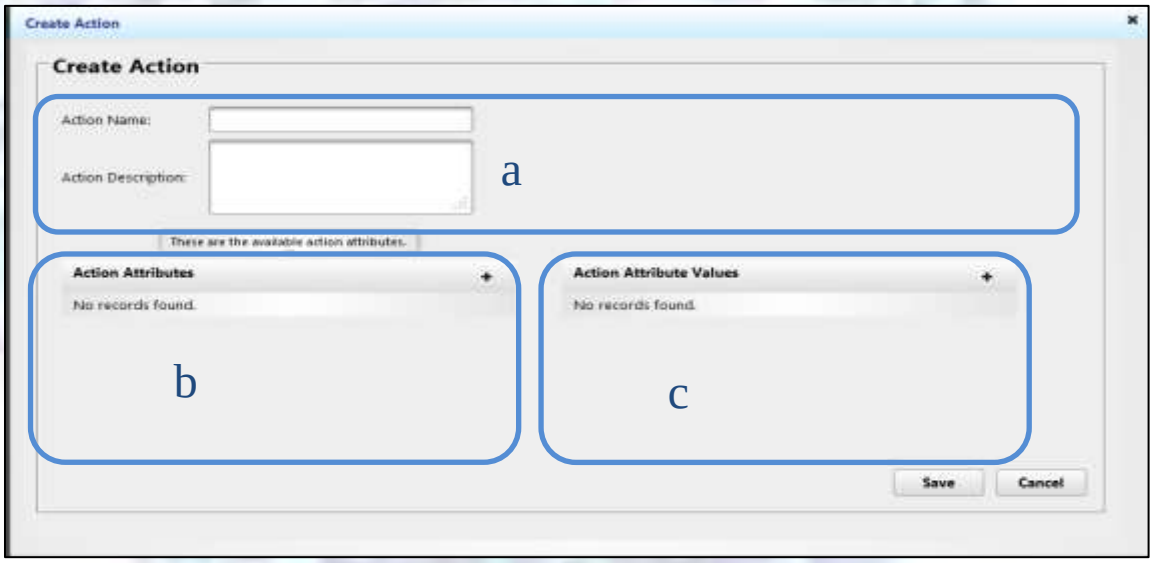
b) The second portion of this interface contains the **Action Attributes** tab that enlists the added Attributes for a given Action. Initially, when there are no records in the database, the "+" button is disabled.

c) The third part of the interface consists of **Action Attribute Values** tab that gives a list of different values for a specific Attribute. When there is no Action added, the "+" sign is disabled.

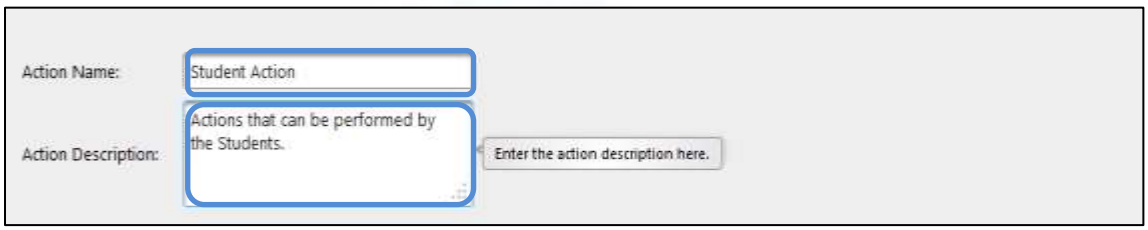
3. Click on the **Add Action** button on the bottom right corner of the below interface.



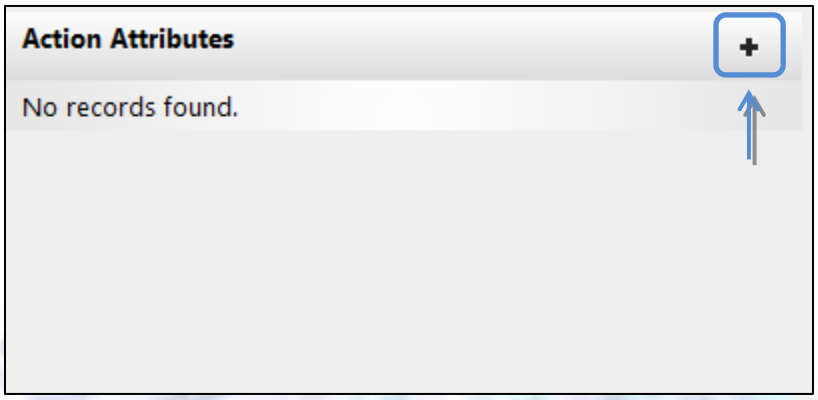
4. The **Create Action** interface is opened to add the required number of Actions. This interface further has three main portions to add the Action , its Attributes and Attribute Values, as highlighted with “a”, “b” and “c” in figure below.



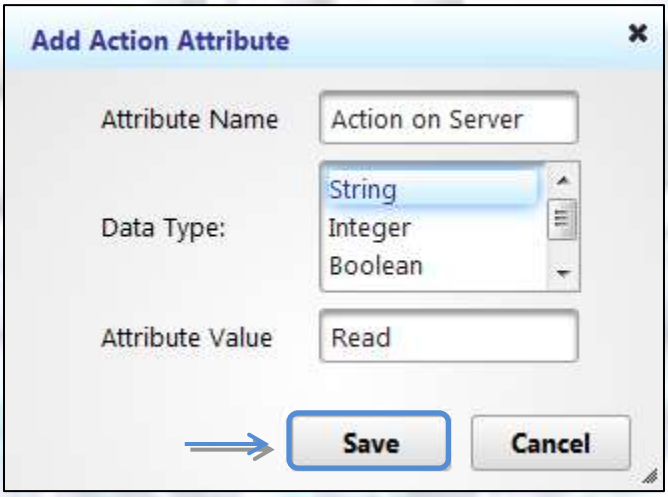
a- 1) The first portion of the interface consists of **Action Name** and **Action Description** text boxes. Add the required name and description in text boxes as shown below.



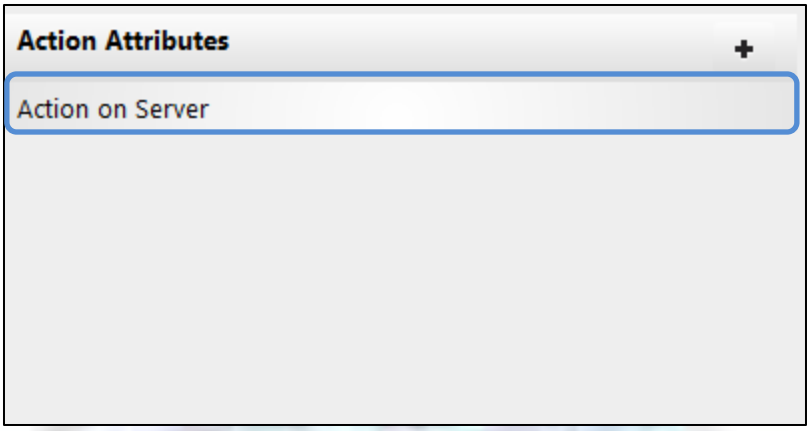
b-1) The second portion of the **Create Action** interface provides the **"+"** button to add the required Attributes to the Action.



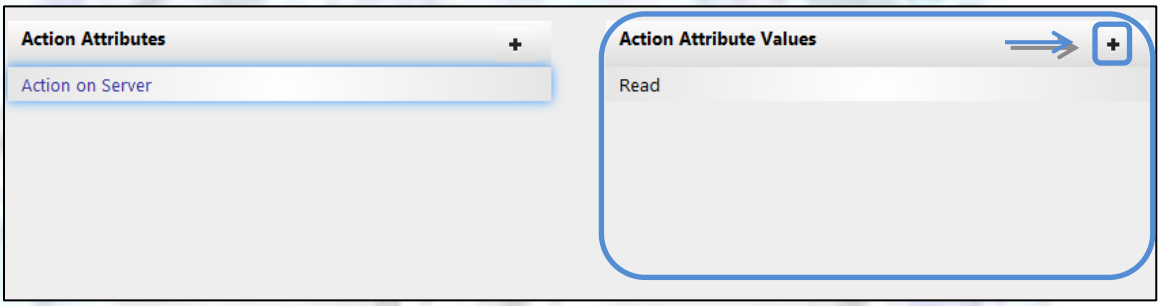
b-2) The following interface is opened to add the required Action Attributes. It consists of **Attribute Name**, **Data Type** and **Attribute Value** text boxes. Enter the required Attribute name, its Value and select the data type from the given list. Finally click on the **Save** button as shown below.



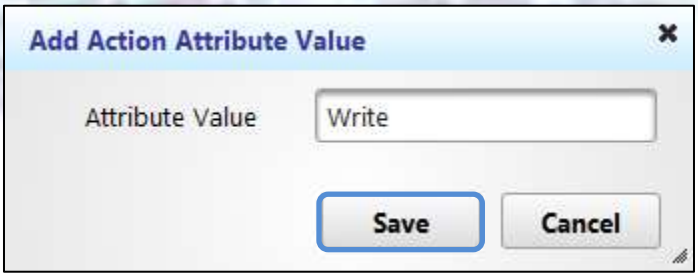
b-3) The added Attribute is displayed under the **Action Attribute** tab as shown in below figure.



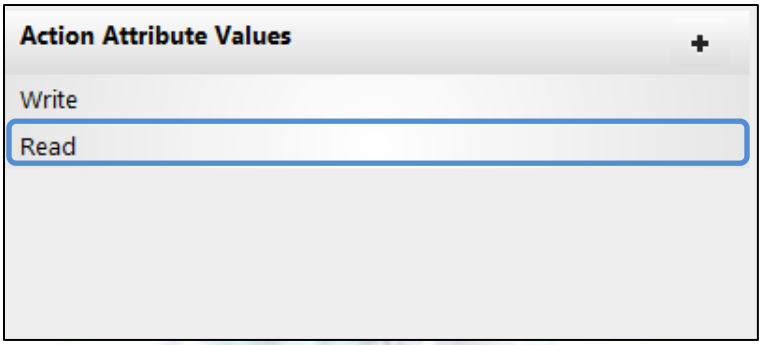
c- 1) The third part of the **Create Action** interface consists of the **"+"** button to add more than one value for specific Attribute. It is compulsory to select the required Attribute from the **Action Attributes** before adding the values. If the **"+"** button is clicked without selecting any Attribute, a warning message is popped out to first select the Attribute.



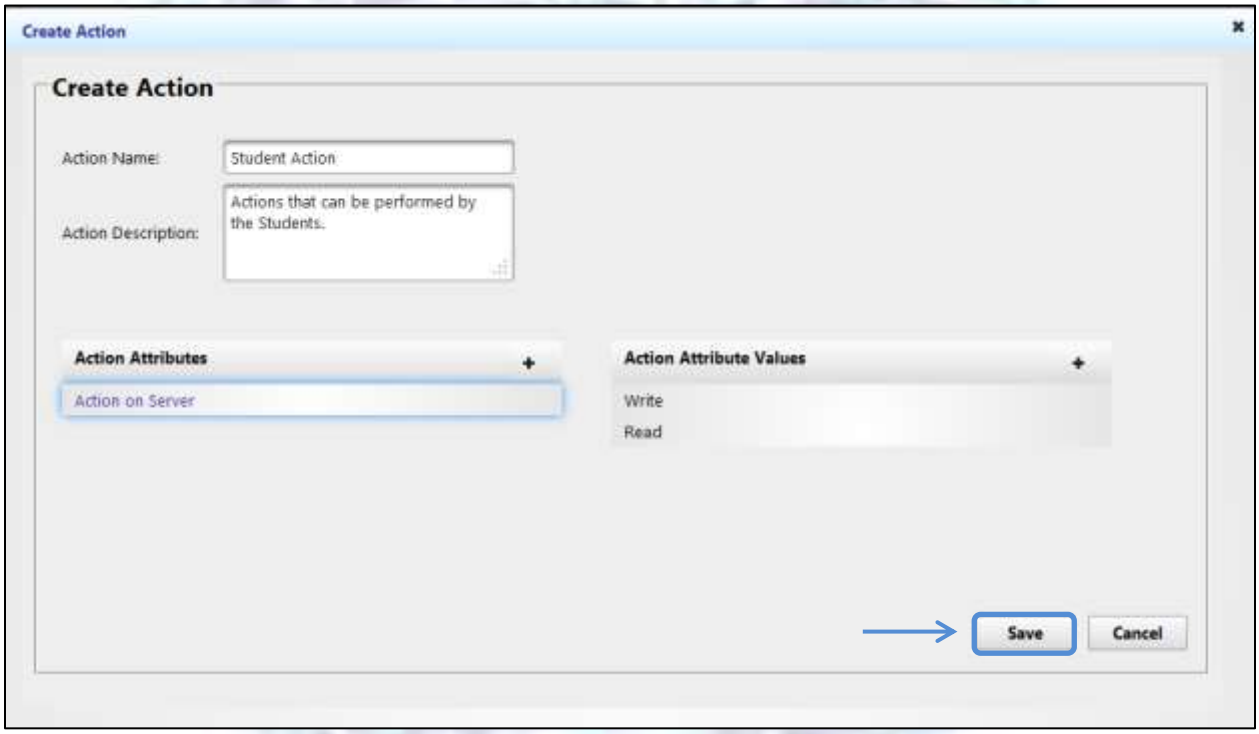
c- 2) On clicking the "+" button, the following window appears on the screen containing the **Attribute Value** text box. Enter the required value for Attribute and then click on **Save** button as shown in below figure.



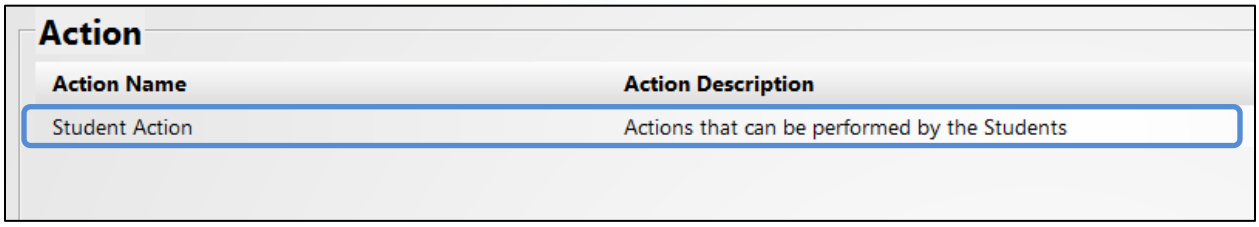
c- 3) After saving the Attribute Value, the following two values are visible under the **Action Attribute Values** tab as shown in below figure.



5. Now click on the **Save** button in the **Create Action** interface to save in database as shown below.

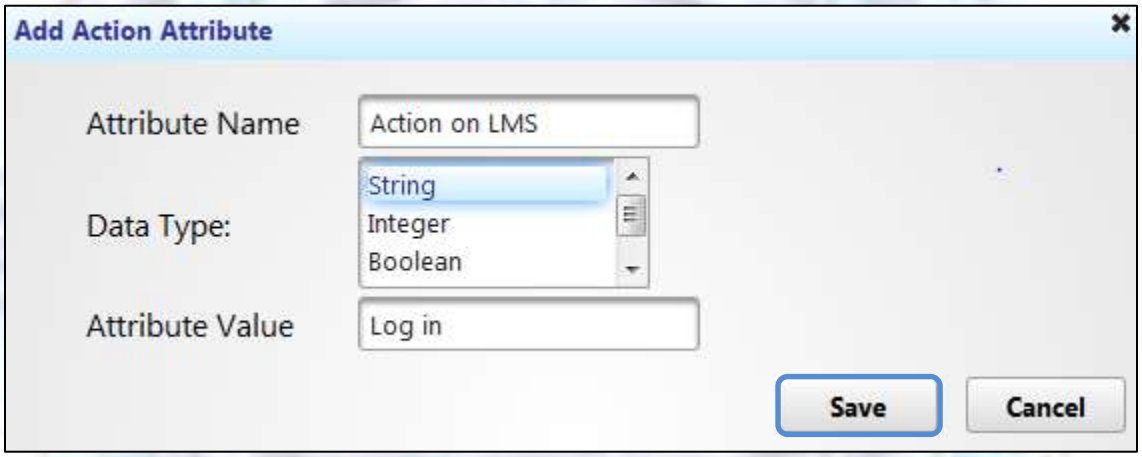


6. The added Action is displayed on **Action** interface with its values under the **Action Name** and **Action Description** tabs as shown in below figure.

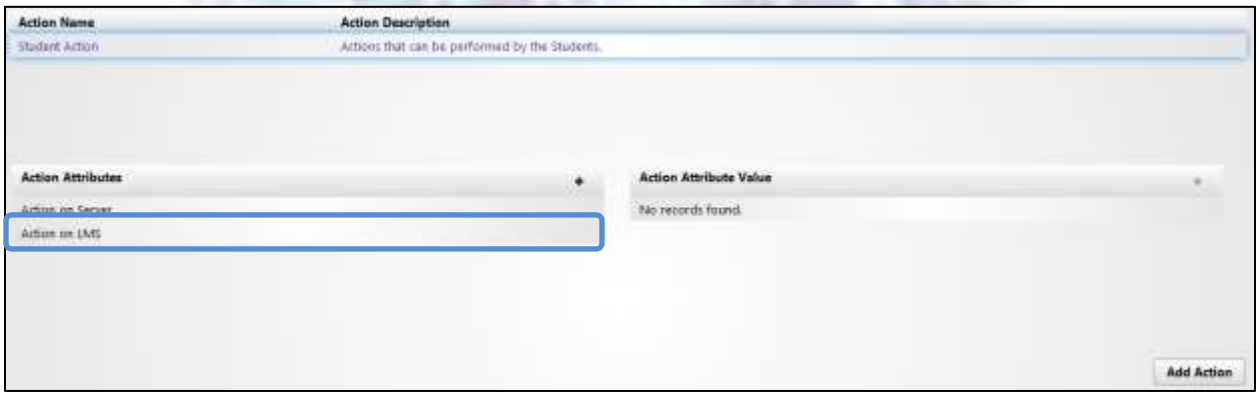


7. Now click on the newly added line of Action, it displays the Attributes of that Action under the **Action Attribute** tab as well as the "+" sign is also enabled to add more Attributes for the selected Action.

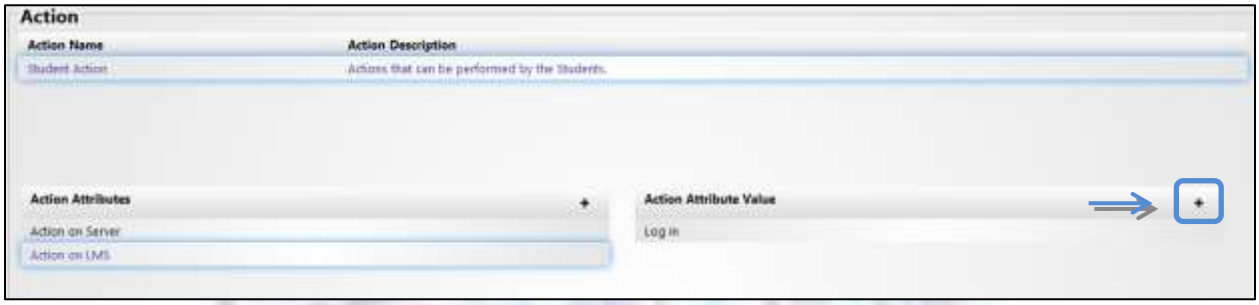
8. On clicking the "+" button following window appears, add the required values for **Attribute Name**, **Data Type** and **Attribute Value** and then click on **Save** button.



9. Now two different Action Attributes are visible under the **Action Attribute** tab as shown in figure below.



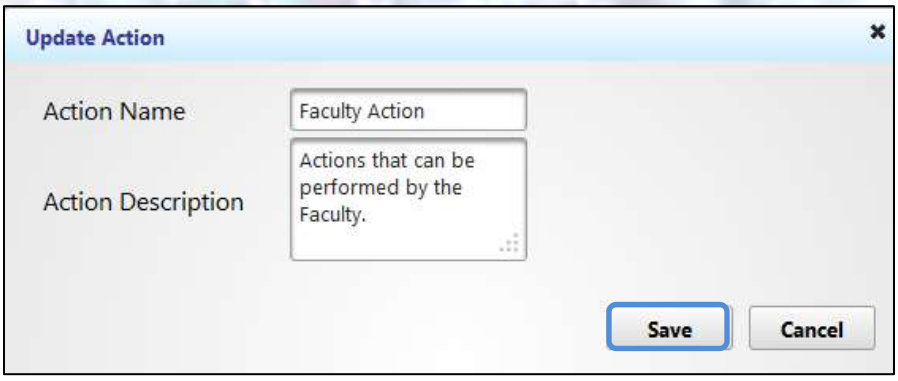
10. In order to view the values for specific Attributes, click on the required Attribute. It enables the "+" button as shown below. By clicking on "+" button more Attribute values can be added to the selected Attribute.



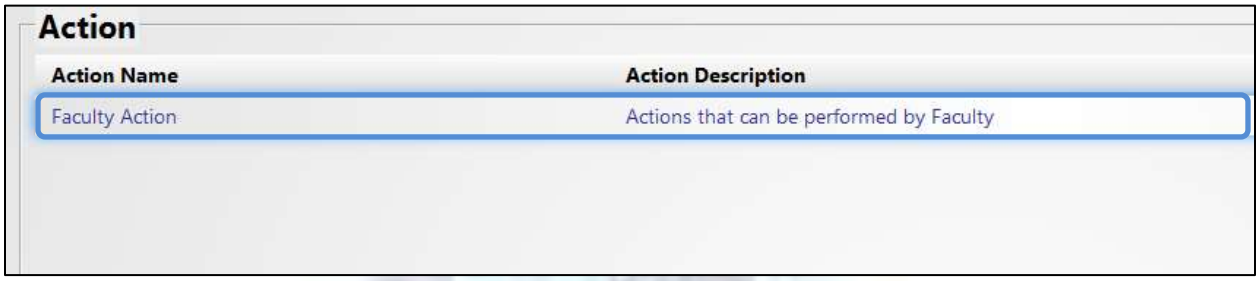
MA- 2: Update Action

1. To update an added Action, right click on that specific Action in main **Action** interface and then select the **Update** option form the menu as depicted in below figure.

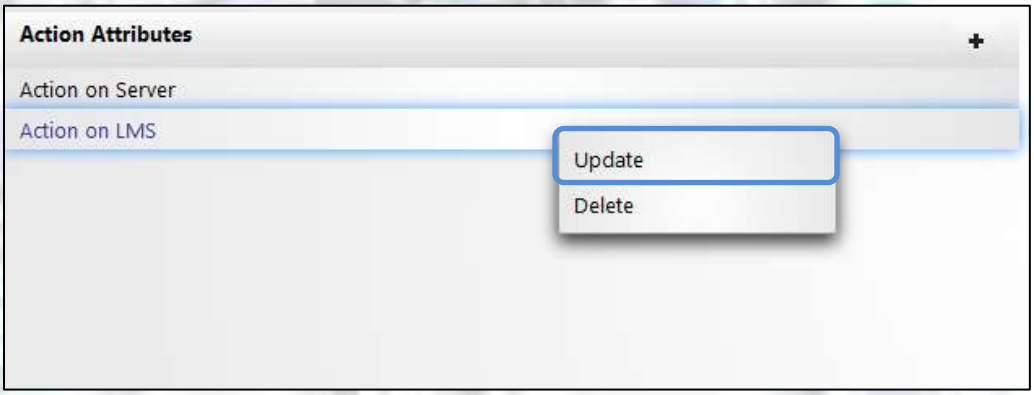
2. The following interface appears after selecting the **Update** option in previous step. You can update any of the two values which include **Action Name** or **Action Description**. After updating the required fields, click on the **Save** button.



3. The updated results are visible on the main **Action** interface as shown below.

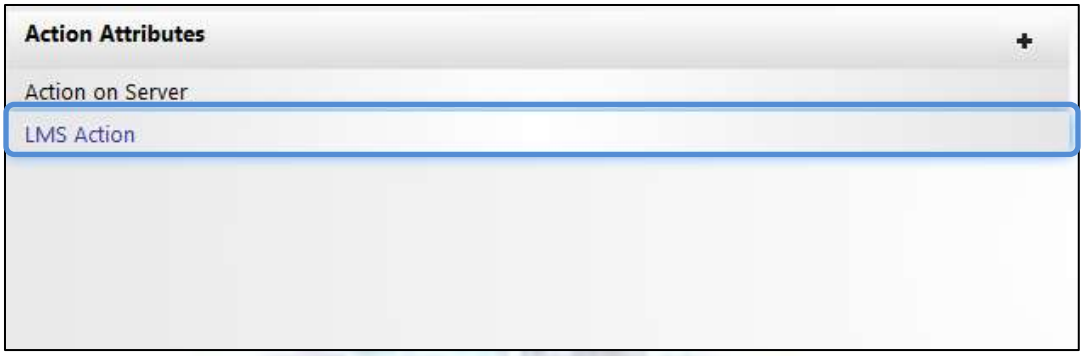


4. Similarly, any Attribute of the Action can also be updated. Right click on the required Attribute under the **Action Attribute** tab of the main **Action** interface. Select the Update option from the menu.



5. **Update Action Attribute** interface is displayed on the screen. Enter the required name in the **Attribute Name** text box and click on **Save** button.

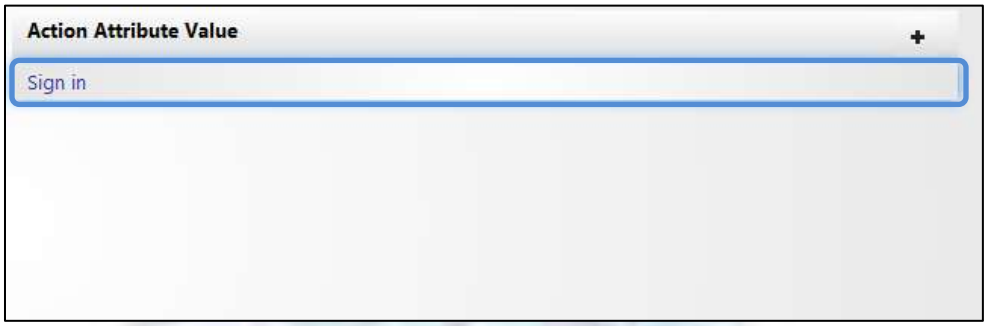
6. The updated results for the particular Attribute appears under the **Action Attribute** tab on main **Action** interface.



7. Similarly, the values for Attribute can also be updated. Right click on the name of the Attribute Value under **Action Attribute Value** tab. Now select the **Update** option from the menu.

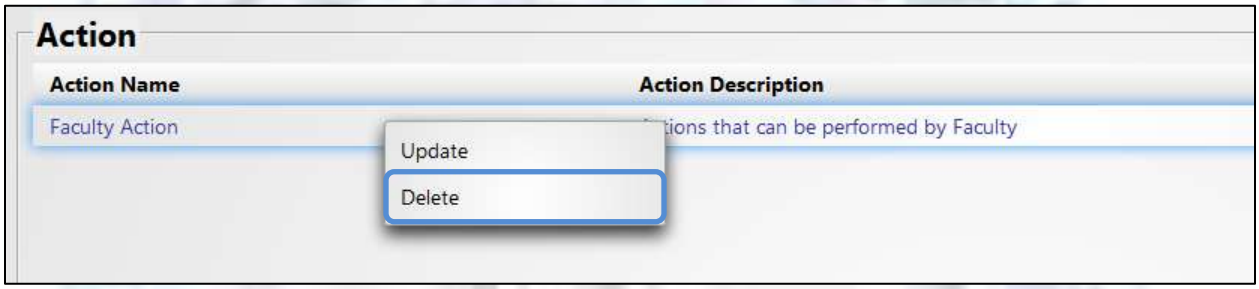
8. The following window is displayed. Enter the new required value for Attribute and then click on **Save** button.

9. The updated value for the Action attribute is displayed instead of the previous value as shown below.

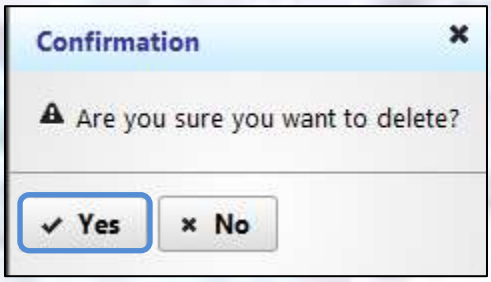


MA- 3: Delete Action

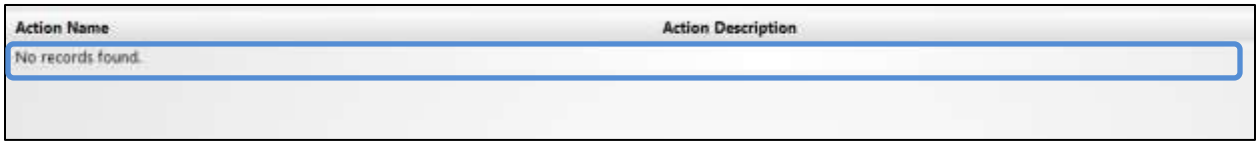
1. To delete a particular Action, click on the name of that Action in main **Action** interface. Select the **Delete** option from the dropdown list.



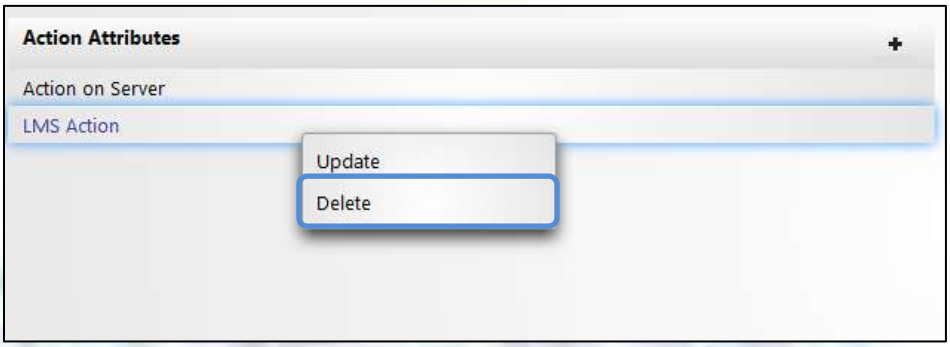
2. Click **Yes** to confirm the deletion in the confirmation dialog box.



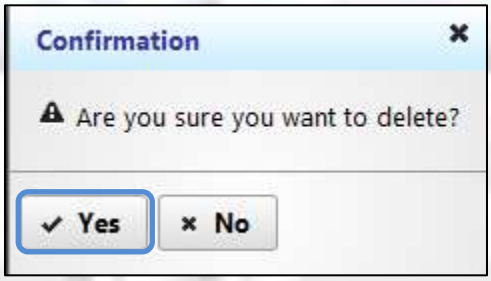
3. The selected Action is deleted as shown in below figure. The **Action Attributes** and **Action Attribute Values** is also deleted for that specific Action.



4. In order to delete an Attribute of particular Action, click on that Attribute under **Action Attribute** tab on the main **Action** interface. Click on the **Delete** option from the menu.

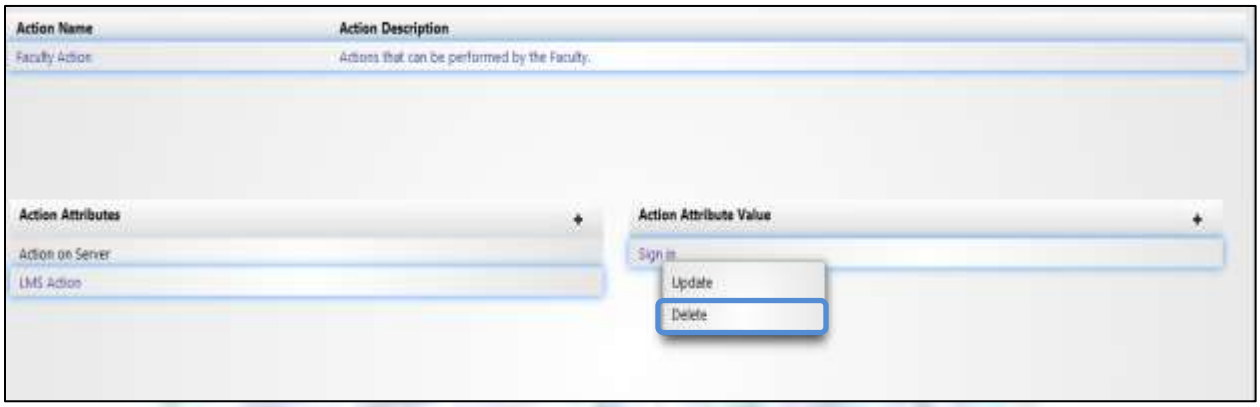


5. Confirm the deletion by clicking on **Yes** in the confirmation Dialog.

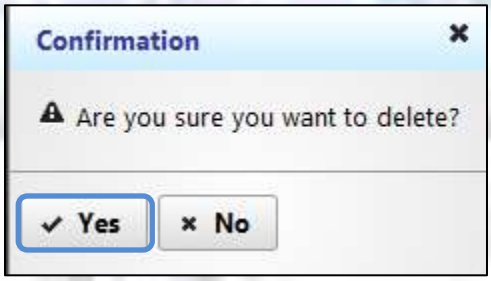


6. The selected Attribute is deleted along with all of its Attribute values as shown in below figure.

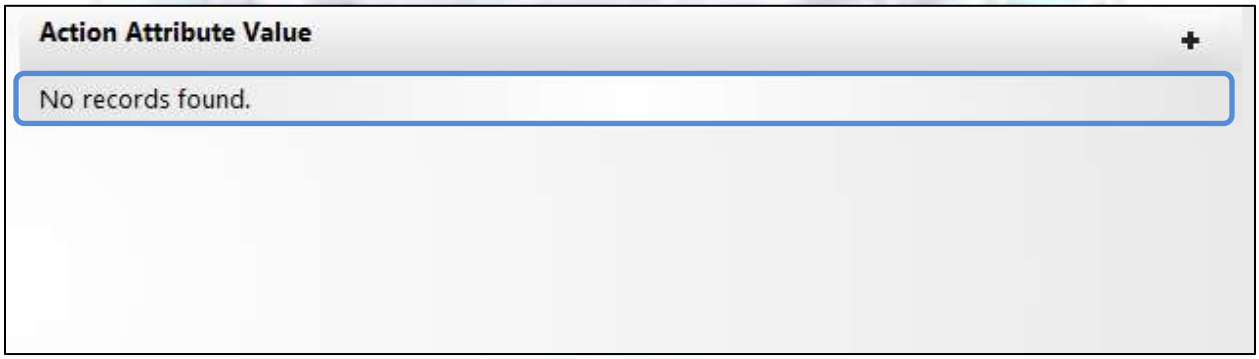
7. To delete a particular Attribute value, click on that value under the **Action Attribute Value** tab and click on the **Delete** option.



8. Confirm the deletion by selecting **Yes** in confirmation Dialog box.



9. The selected Attribute value is deleted as shown in below figure.



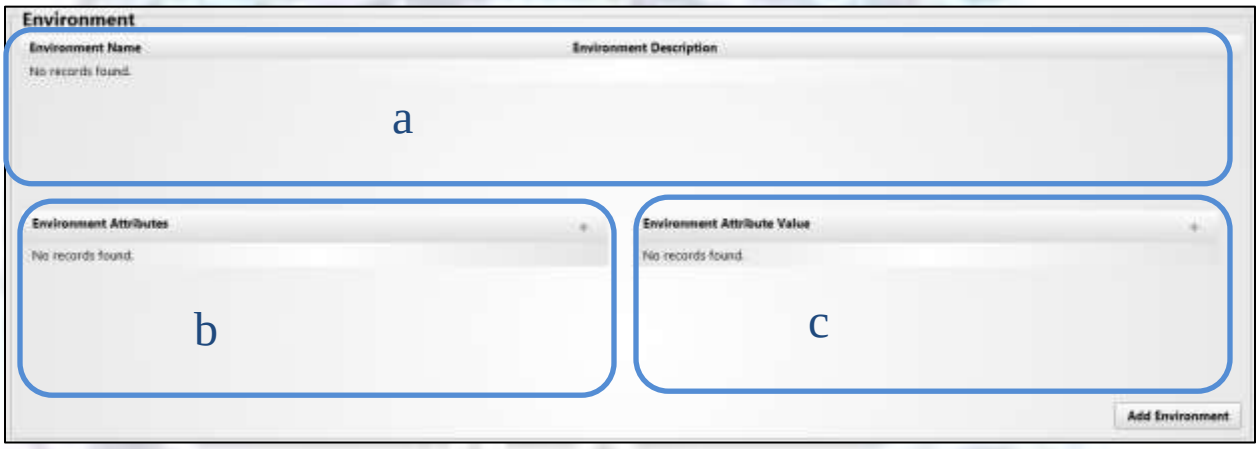
SL- 4: Manage Environment

In this section, we demonstrate how to create, update and delete the Environment in 'System Learning' phase.

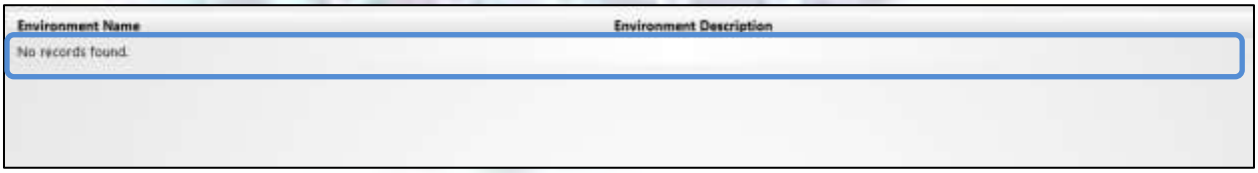
ME- 1: Create Environment

1. In order to create Environment, select the **Environment** option from dropdown list as depicted below.

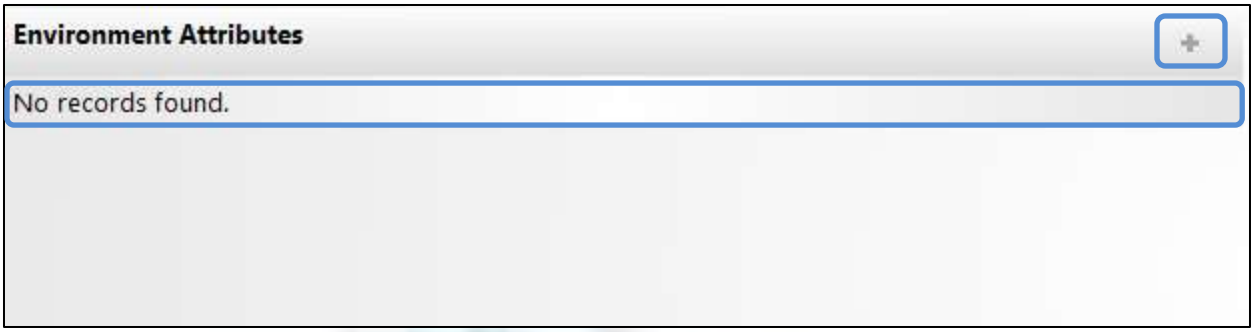
2. After selecting the **Environment** option in previous step, the following **Environment** interface is opened. This interface further includes three main portions as highlighted with "a", "b" and "c" in the below figure.
3.



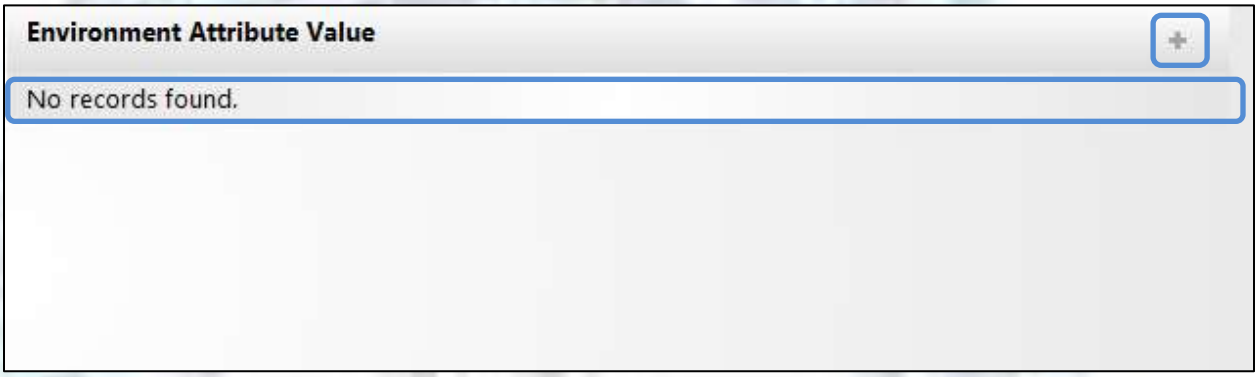
a) The upper portion of the **Environment** interface contains **Environment Name** and **Environment Description** tabs. Initially, when no Environment is added in the database, "*No records found"* is displayed.



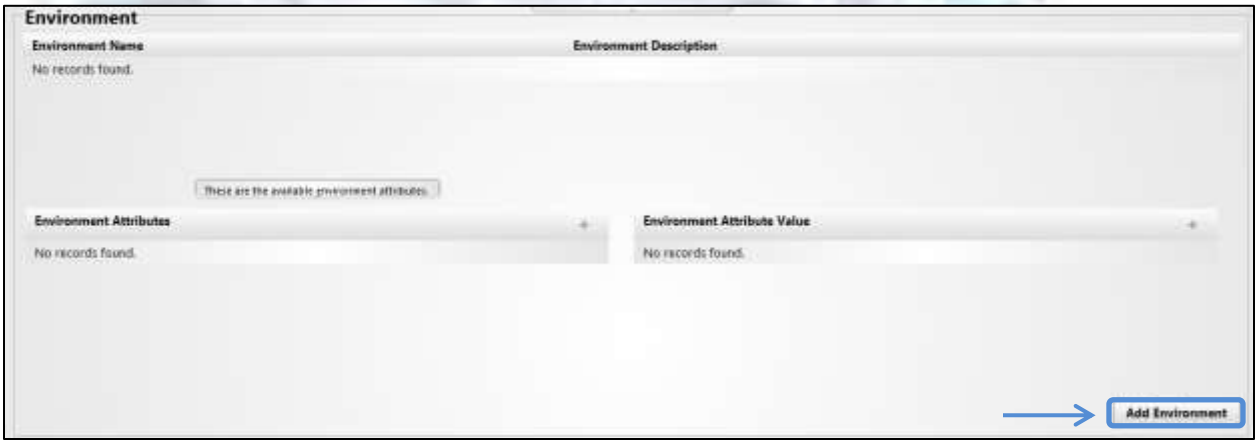
b) The second portion of this interface contains the **Environment Attributes** tab that enlists the added Attributes for a given Environment. Initially, when there are no records in the database, the "+" button is disabled.



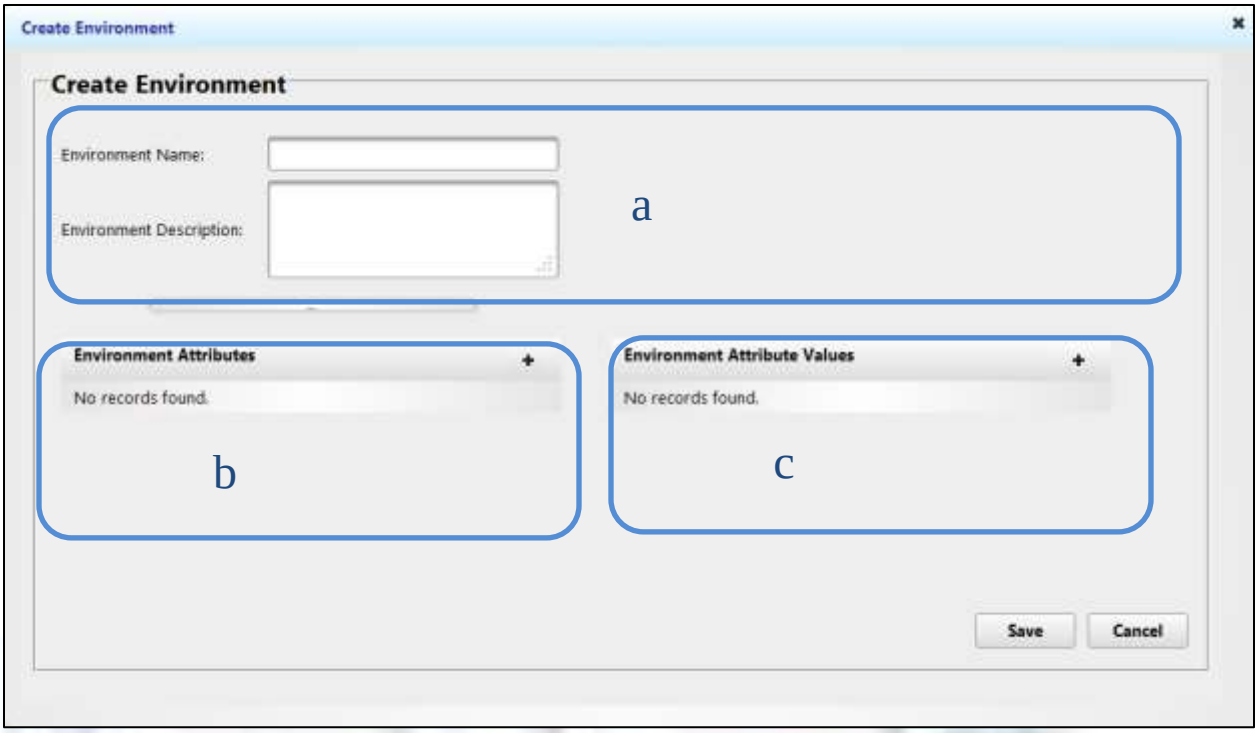
c) The third portion of the interface consists of **Environment Attribute Values** tab that gives a list of different values for a specific Attribute. At the start, when no Environment, Attribute and Attribute values are added, the "+" sign is disabled.



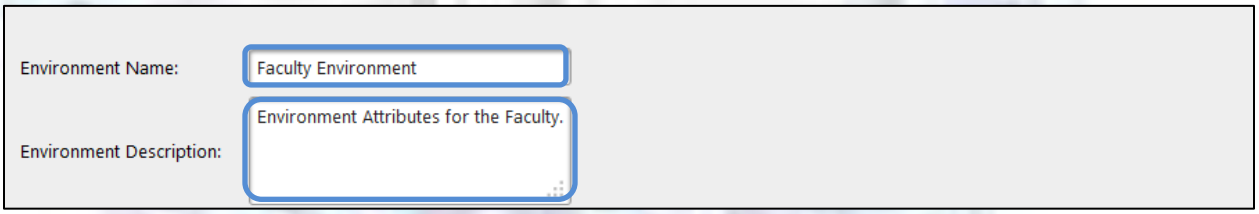
4. Click on the **Add Environment** button on the bottom right corner of the below interface.



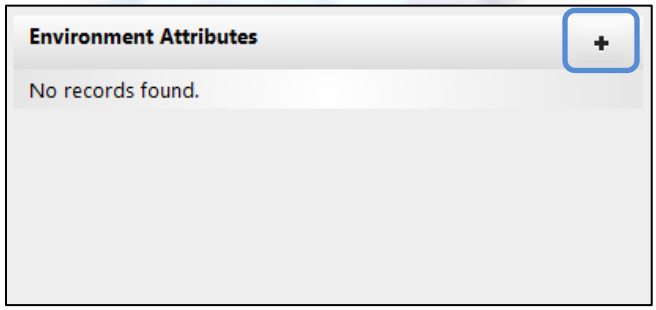
5. The **Create Environment** interface is opened to add the required number of Environments. This interface further has three main portions to add the Environment , its Attributes and Attribute values, as highlighted with "a", "b" and "c" in figure below.



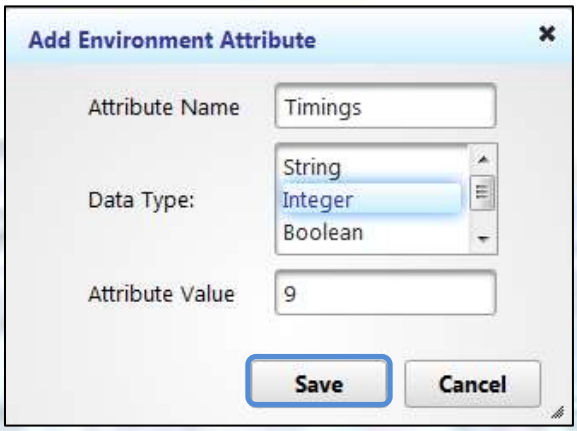
a-1) The first portion of the interface consists of **Environment Name** and **Environment Description** text boxes. In order to create an Environment, add the required name and description in text boxes as shown below.



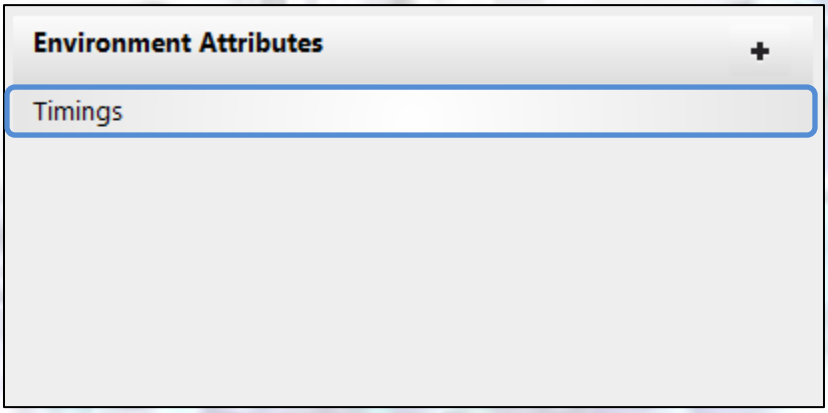
b-1) The second part of the **Create Environment** interface provides the "+" Button to add the required Attributes to the added Environment in previous step.



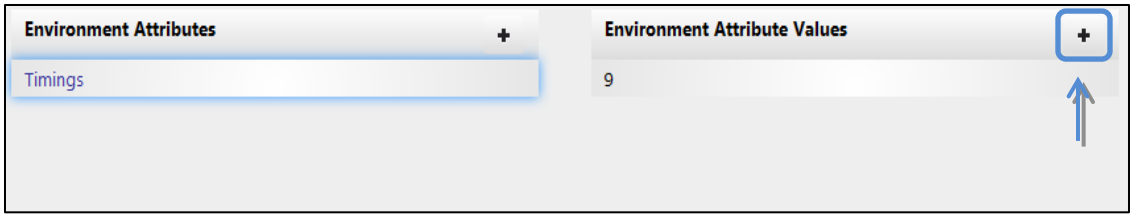
b-2) The following interface is opened to add the required Environment Attributes. It consists of **Attribute Name**, **Data Type** and **Attribute Value** text boxes. Enter the required Attribute name, its value and select the data type from the given list. Finally click on the **Save** button as shown below.



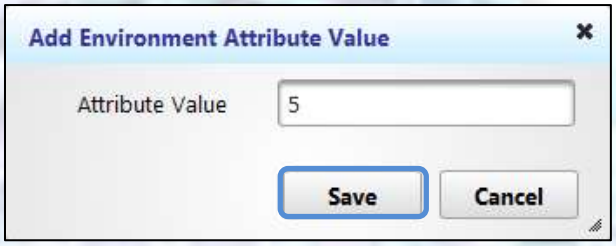
b-3) The added Attribute is displayed under the **Environment Attribute** tab as shown in below figure.



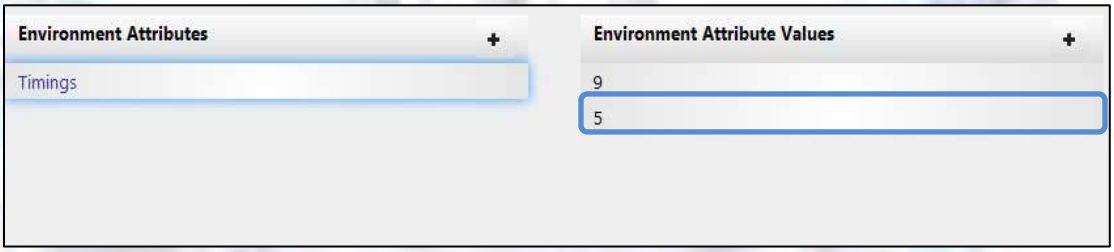
c- 1) The third portion of the **Create Environment** interface consists of the **"+"** button to add more than one value for specific Attribute. It is compulsory to select the required Attribute from the **Environment Attributes** before adding the values. If the **Add Attribute Value** button is clicked without selecting any Attribute, a warning message is popped out to first select the desired Attribute.



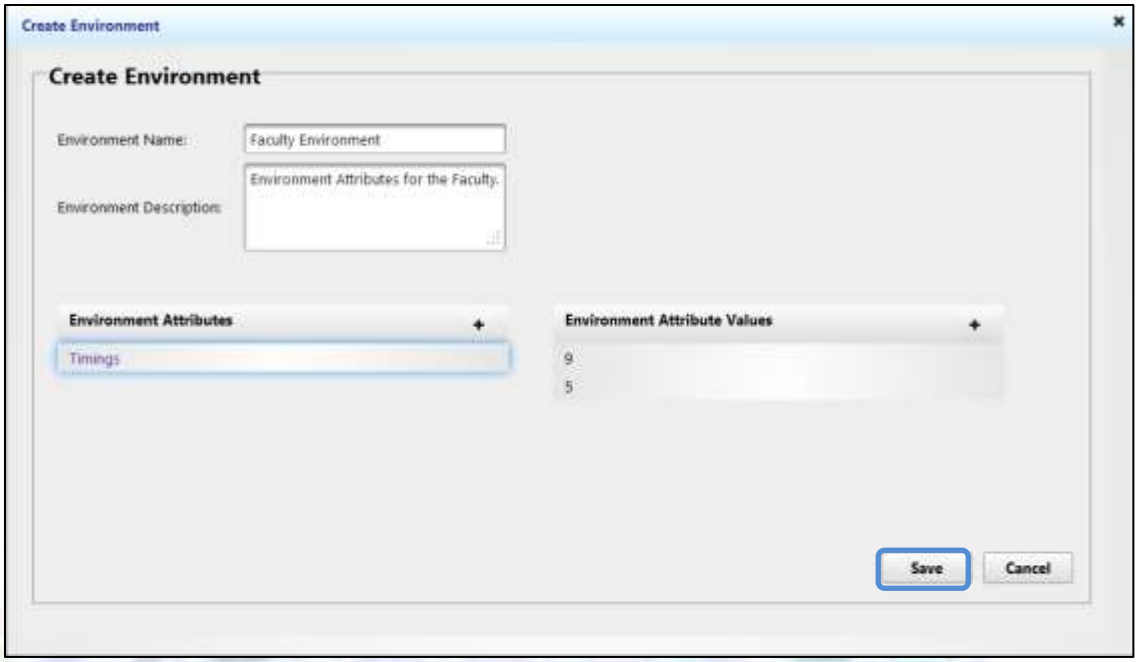
c- 2) On clicking the "+" button in **Environment Attribute Values,** the following window appears on the screen containing the **Attribute Value** text box. Enter the required value for Attribute and then click on **Save** button as shown in below figure.



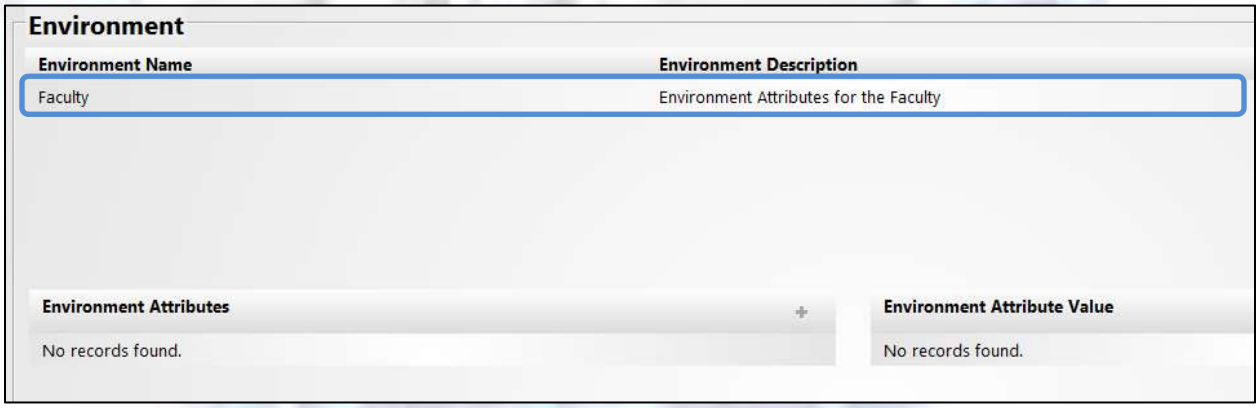
c- 3) After saving the Attribute Value, the following two values are visible under the **Environment Attribute Values** tab as shown in below figure.



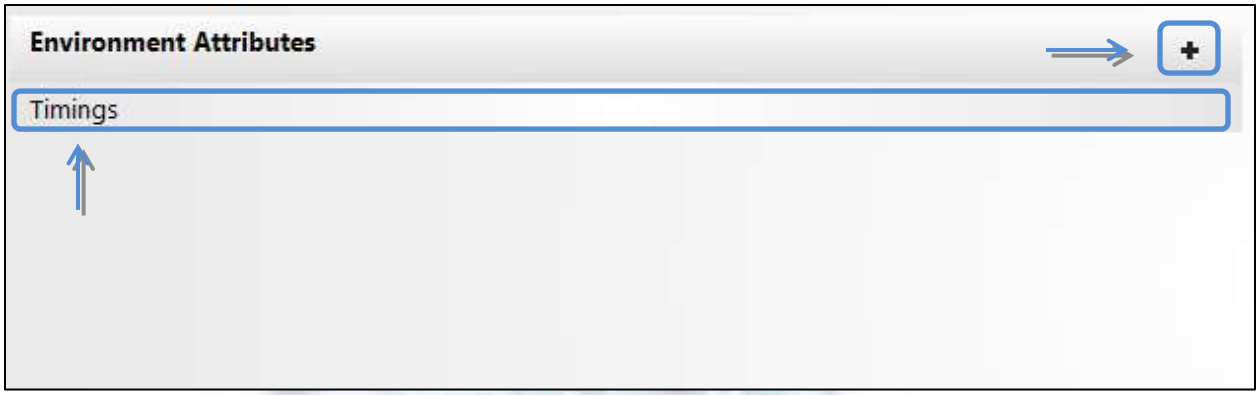
c- 4) Now click on the **Save** button in the **Create Environment** interface to save the added Environment in database as shown below.



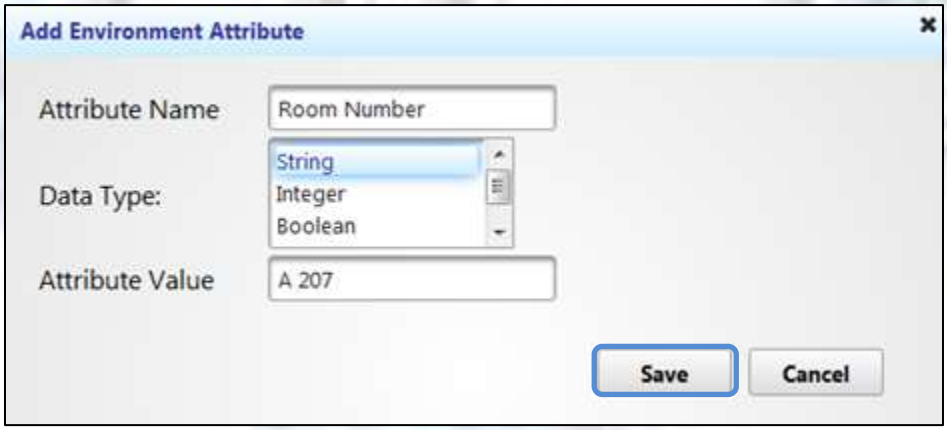
6. The added Action is displayed on **Environment** interface with its values under the **Environment Name** and **Environment Description** tabs as shown in below figure.



7. Now click on the newly added line of Environment, it displays the Attributes of that Environment under the **Environment Attribute** tab as well as the "+" sign is also enabled to add more Attributes for the selected Environment.

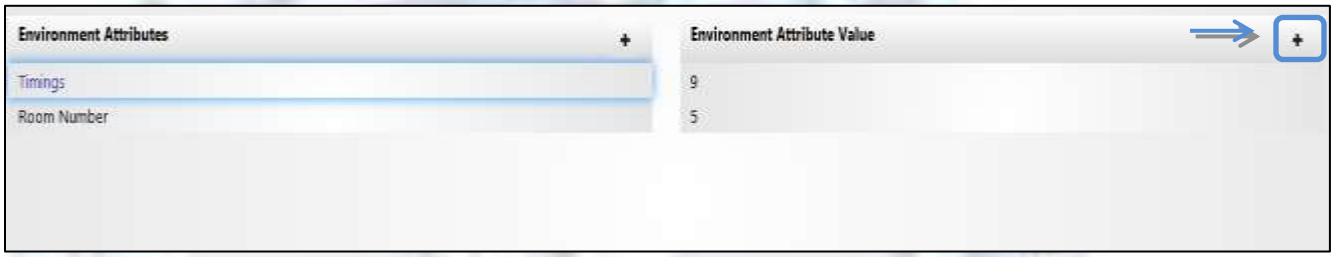


8. On clicking the "+" button following window appears, add the required values for **Attribute Name**, **Data Type** and **Attribute Value** and then click on **Save** button.



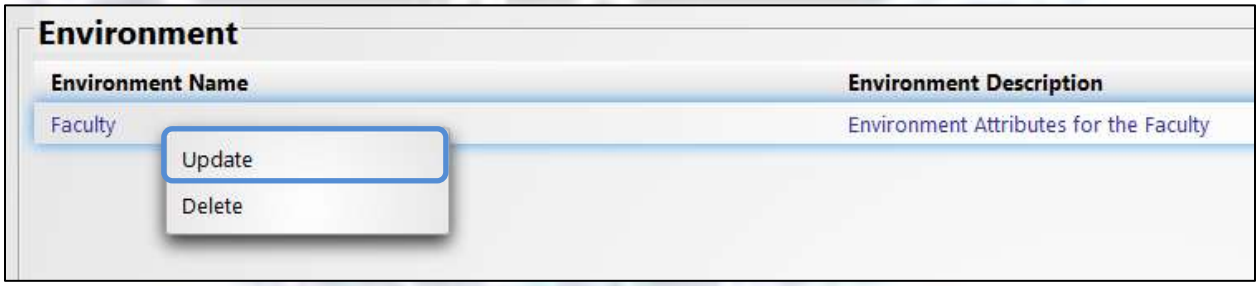
9. Now two different Environment Attributes are visible under the **Environment Attributes** tab as shown in figure below.

10. In order to view the values for specific Attributes, click on the required Attribute. It also enables the "+" button as shown below. By clicking on "+" button more Attribute values can be added to the selected Attribute.

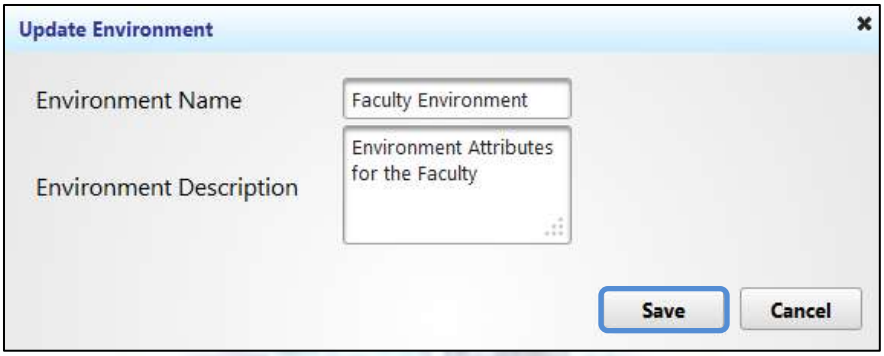


ME- 2: Update Environment

1. To update an added Environment, right click on that specific Environment in main **Environment** interface and then select the **Update** option form the menu as depicted in below figure.



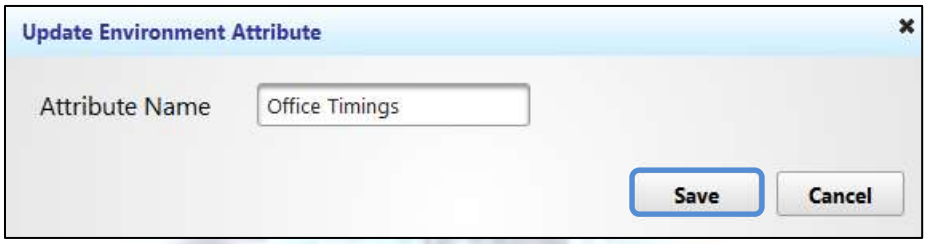
2. The following interface appears after selecting the **Update** option in previous step. You can update any of the two values which include **Environment Name** or **Environment Description**. After updating the required fields, click on the **Save** button.



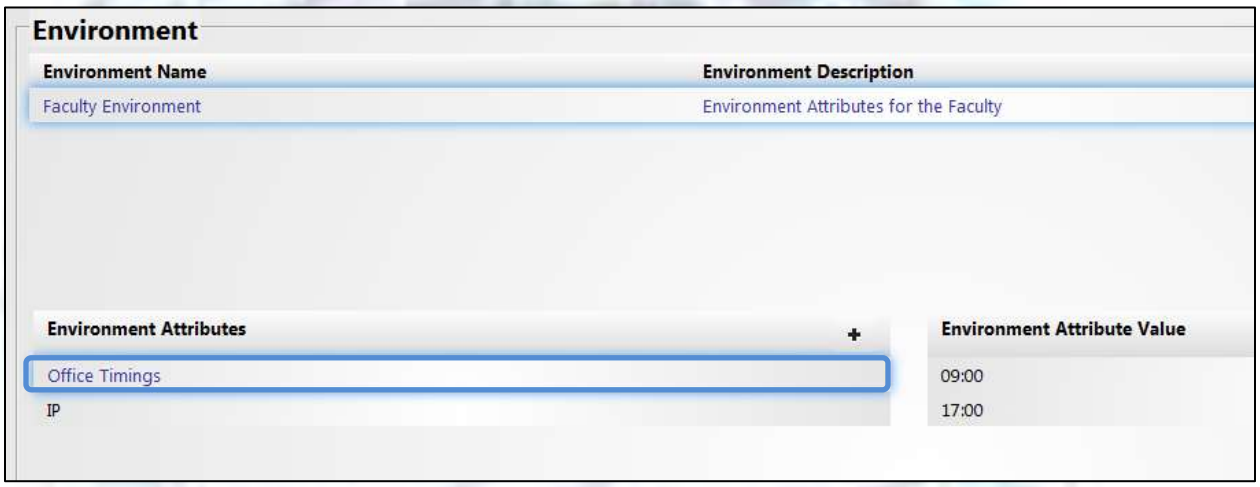
3. The updated results are also visible on the main **Environment** interface as shown below.

4. Similarly, any Attribute of the Environment can also be updated. Click on the required Attribute under the **Environment Attribute** tab of the main **Environment** interface. A dropdown menu appears on screen. Select the Update option.

5. **Update Environment Attribute** interface is displayed on the screen. Enter the required name in the **Attribute Name** text box and click on **save** button.

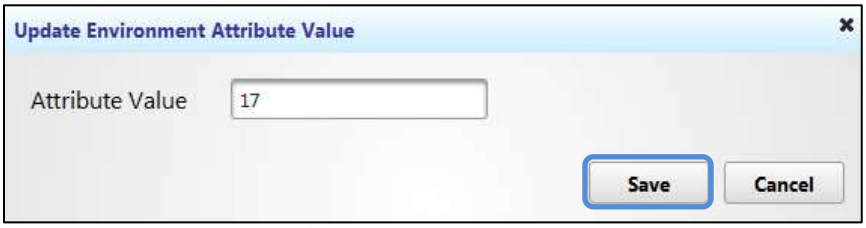


6. The updated results for the particular Attribute appears under the **Environment Attribute** tab on main **Environment** interface.

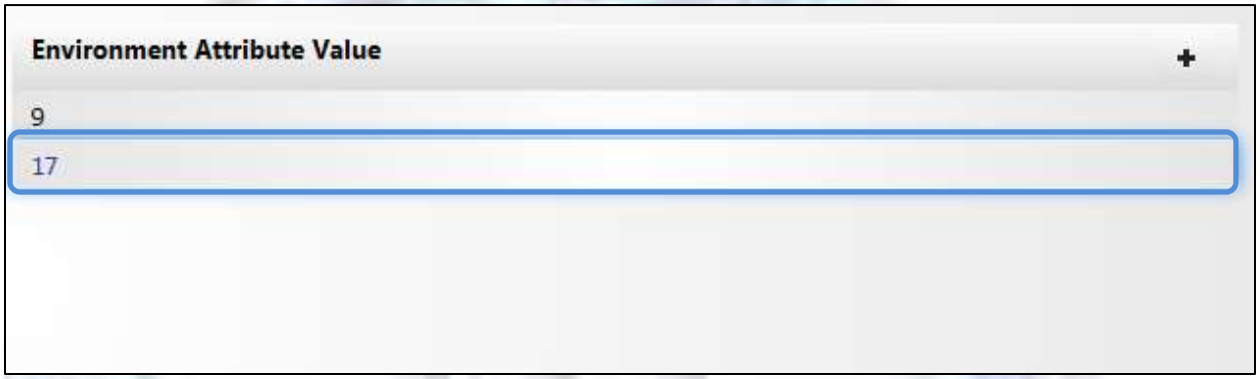


7. Similarly, the values for Attribute can also be updated. Right click on the name of the Attribute Value under **Environment Attribute Value** tab. Now select the **Update** option from the dropdown list.

8. The following window appears on screen. Enter the new required value for Attribute and then click on **Save** button.



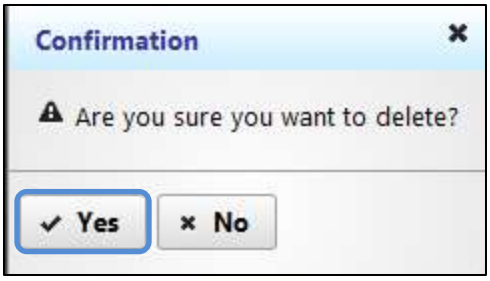
9. The updated value for the Environment Attribute is displayed instead of the previous value as shown below.



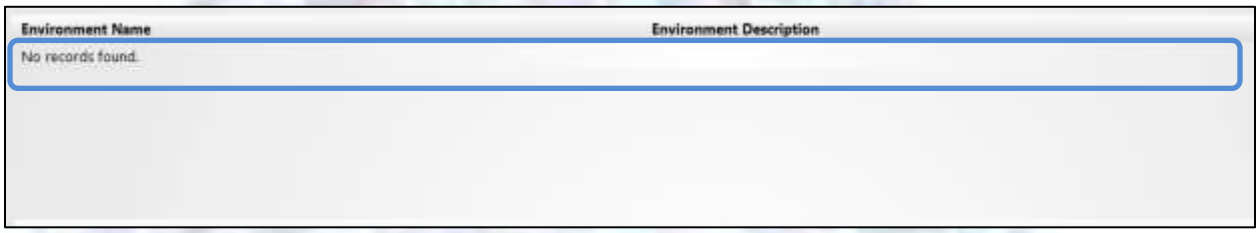
ME- 3: Delete Environment

1. Right click on the name of that Environment in main **Environment** interface. Select the **Delete** option from the dropdown list.

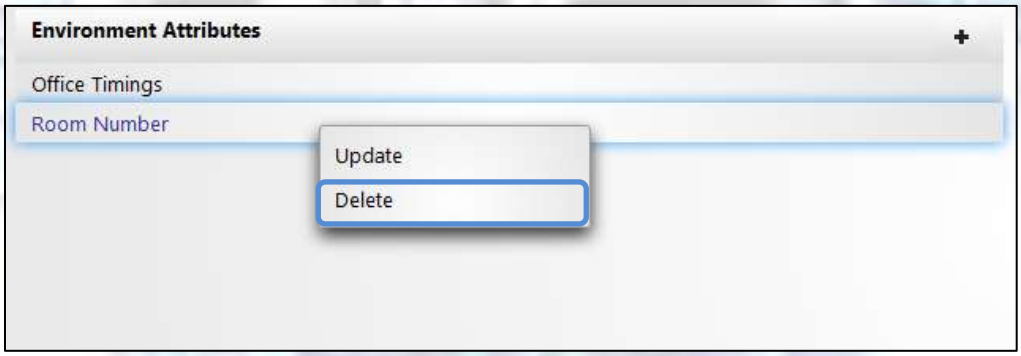
2. Click **Yes** in the confirmation dialog box.



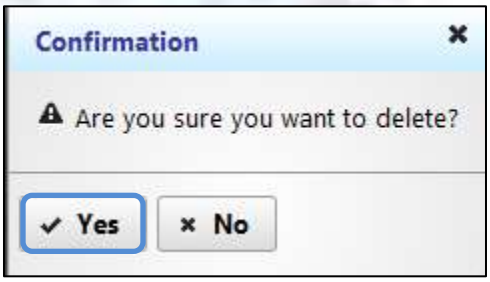
3. The selected Environment is deleted as shown in below figure. The **Environment Attributes** and **Environment Attribute Values** are also deleted for that specific Environment.



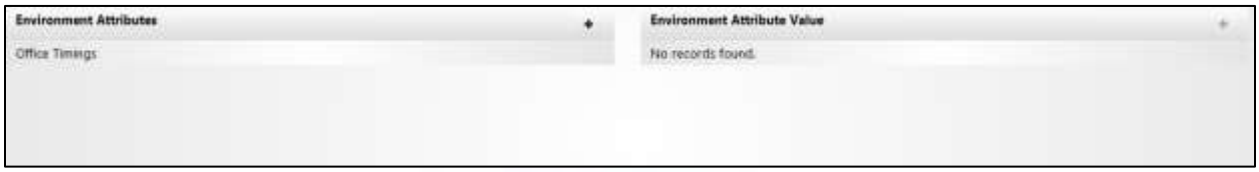
4. In order to delete an attribute of particular Environment, click on that attribute under **Environment Attribute** tab on the main **Environment** interface. Click on the **Delete** option from the dropdown list.



5. Click **Yes** in confirmation Dialog box.

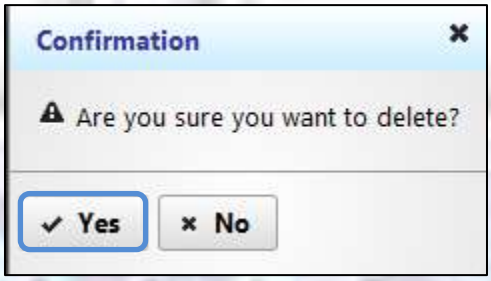


6. On confirmation the selected Attribute is deleted along with all of its Attribute Values as shown in below figure.



7. To delete a particular Attribute Value, click on that value under the **Environment Attribute Value** tab and click on the **Delete** option.

8. Click **Yes** in confirmation Dialog box.



9. The deleted Attribute Value is removed as shown below:

B. Policy Creation:

In this section, we demonstrate the procedure to perform add, update and delete operations on the Target, Condition, Rule, Policy and Policy Set attributes in the 'Policy Creation' phase.

Select **Policy Creation** option form the main interface of policy administration point.

Clicking on 'Policy Creation' will display its associated options that are Target, Condition, Rule, Policy and Policy Set. Accordingly, the four main subsections include **Manage Target**, **Manage Condition, Manage Rule**, **Manage Policy** and **Manage Policy Set**.

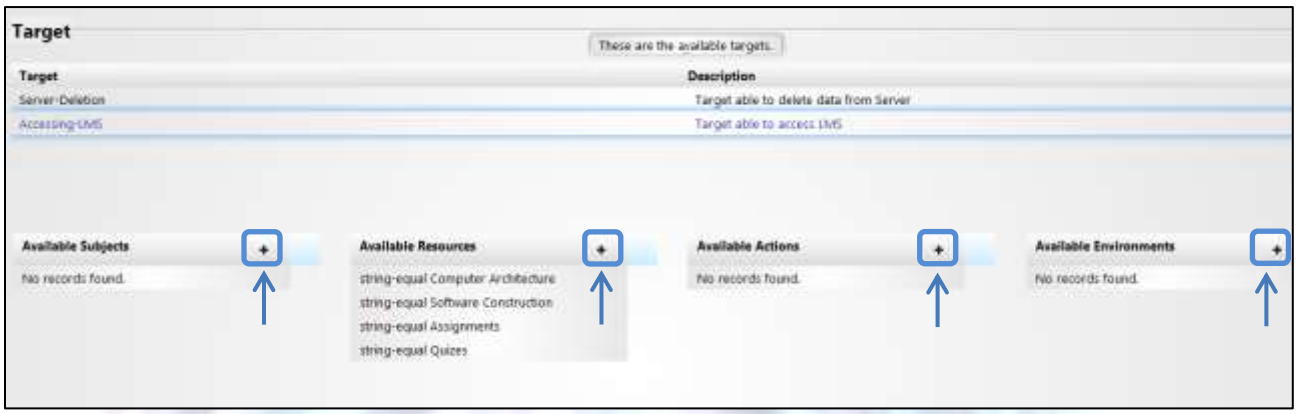
PC - 1. Manage Target:

Select **Target** option from the main **Policy Creation** dropdown-menu to add, update and delete Targets and its related attributes including Subject, Action, Resource and Environment.

MT - 1: Create Target

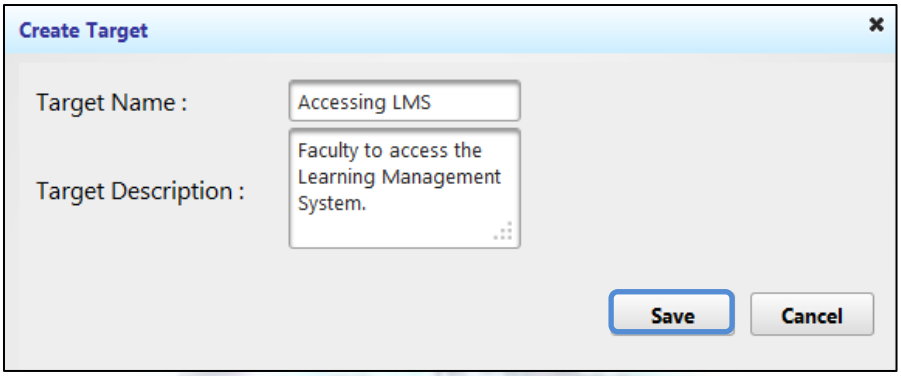
1. Below is the main **Target** interface, which is used to add, update and delete Target attributes. It also provides the provision to associate existing Subject, Resource, Action and Environment attributes with the new or existing Target attributes.

2. Initially, if a Target does not exists in the database or if any target is not selected then add ("+") option for **Available Subjects**, **Available Resources**, **Available Actions** and **Available Environments** is disabled, otherwise it active, and any attribute in a target can be added by selecting target and clicking on "+" button.



3. Click on **Add Target** button, to add new Target attribute into the database.

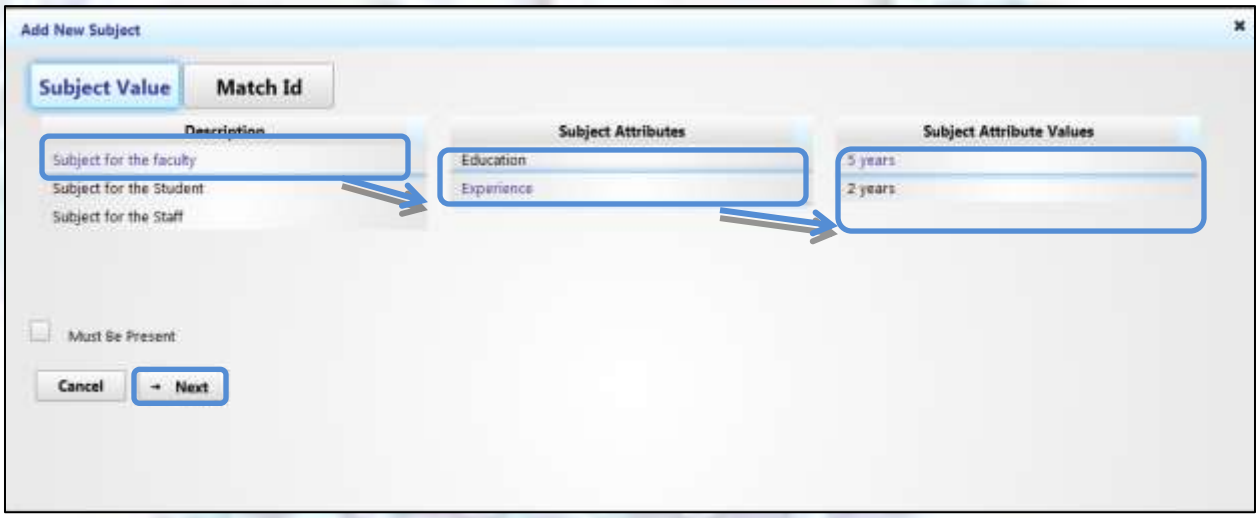
4. In the **New Target** interface, specify Target name, add its description and click **Save** to insert the new Target attribute into the database and **Cancel** to discard the added information.



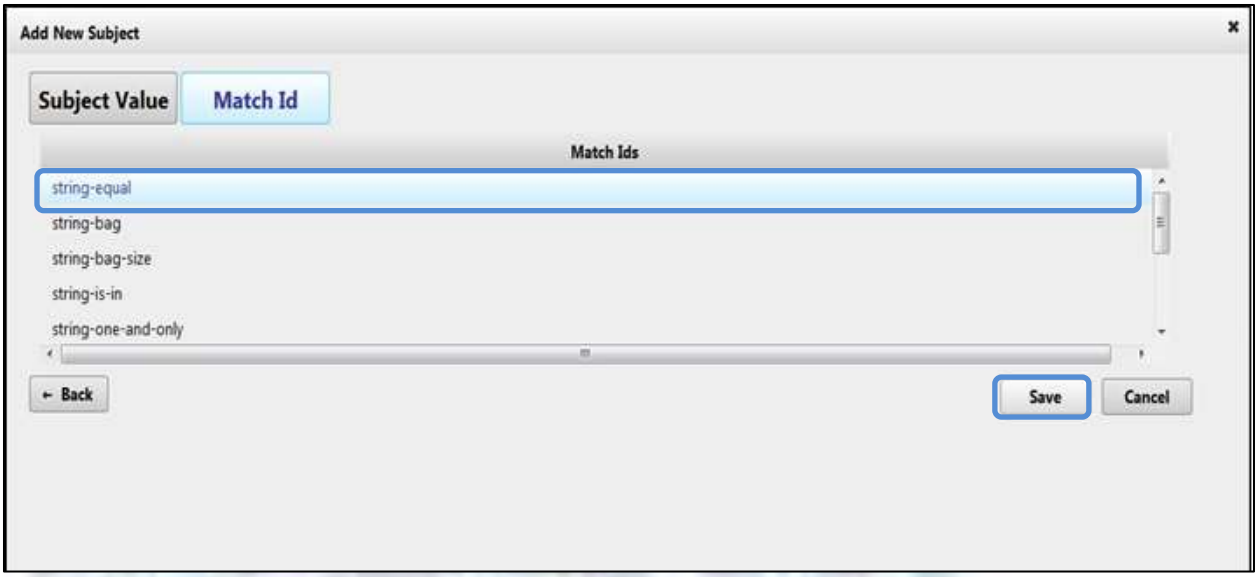
5. Upon successful creation of Target, its name and description appears in the main **Target** interface. Selecting any Target from the available list enables the add/update "+" option for **Available Subjects**, **Available Resources**, **Available Actions** and **Available Environments**.

a-1) Click on "+" option to add/update **Available Subjects** against the selected Target attribute. In the **Subject Value** tab, select Subject **Description** from the available list. As a result of this selection, list of available Subject Attributes is displayed.

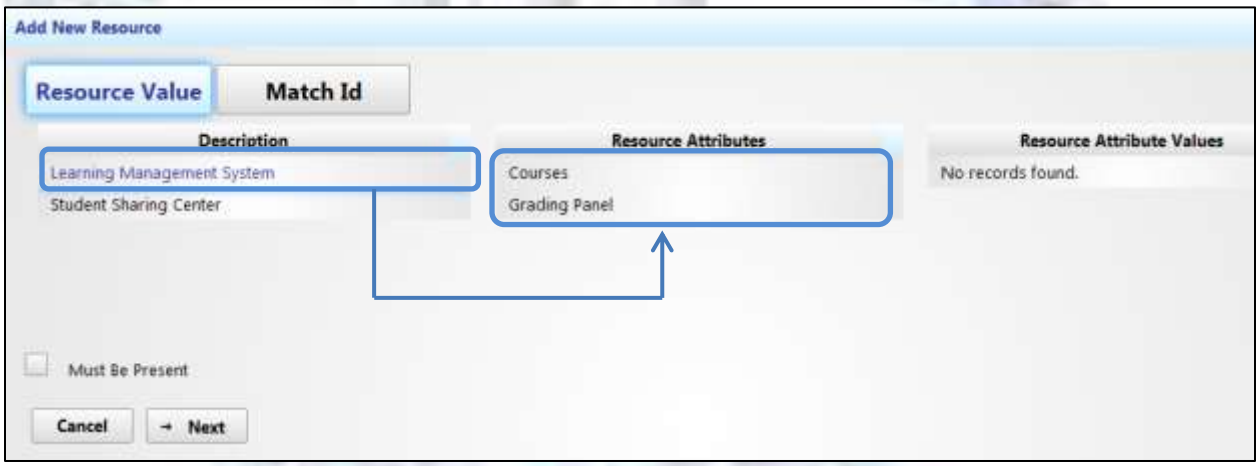
a-2) Click on any of the **Subject Attribute** from the available list to view its values. As a result, a complete list of possible values is displayed under **Subject Attribute Values** tab, select any particular value and click **Next**.



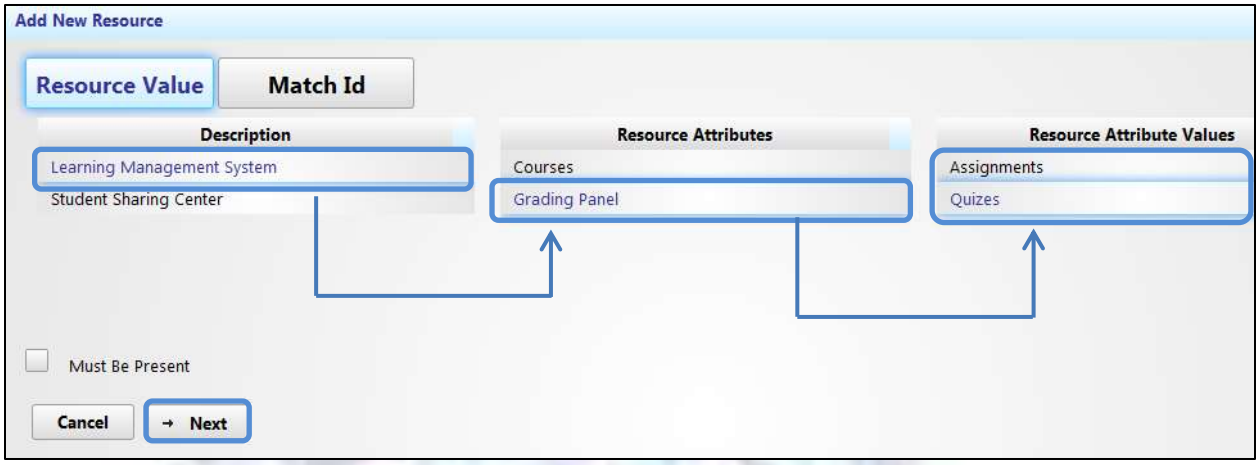
a-3) In the **Match Id** tab, list of possible Match Ids for the previously selected Subject value is presented. Select any Match Id value from the available list and click **Save** to add the selection (**Subject Value** and **Match Id**) against the individual Target.



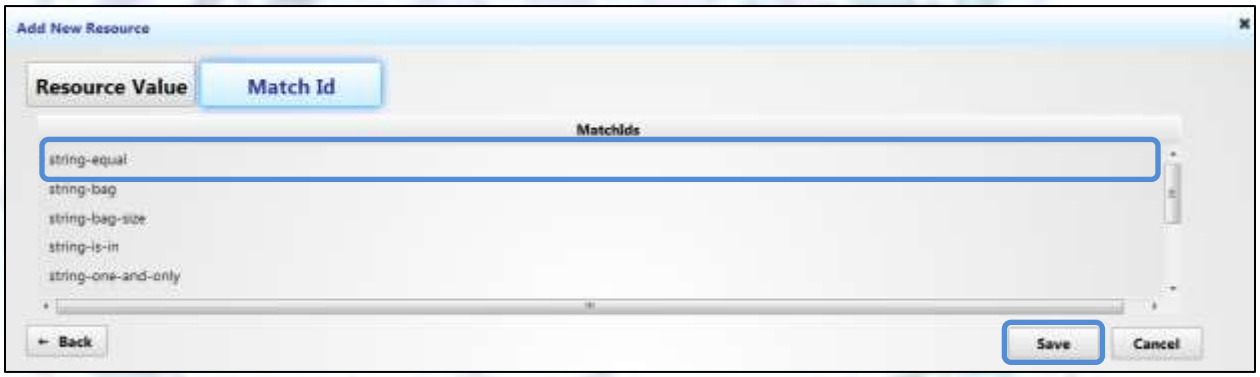
b-1) Click on "+" option to add/update **Available Resource** against the selected Target attribute. In the **Resource Value** tab, select Resource **Description** from the available list. As a result of this selection, list of available Resource Attributes is displayed.



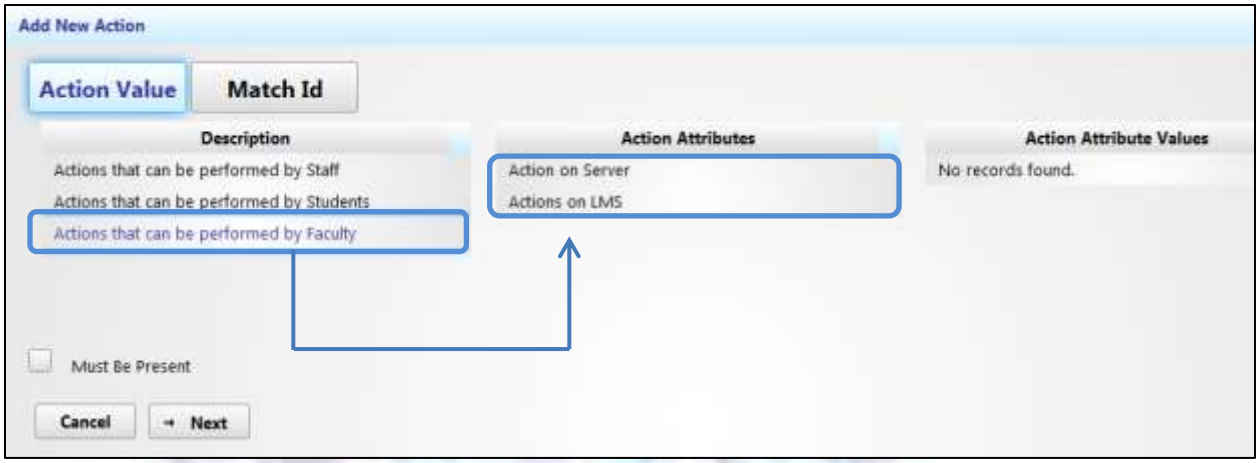
b-2) Click on any of the **Resource Attribute** from the available list to view its values. As a result, a complete list of possible values is displayed under **Resource Attribute Values** tab, select any particular value and click **Next.**



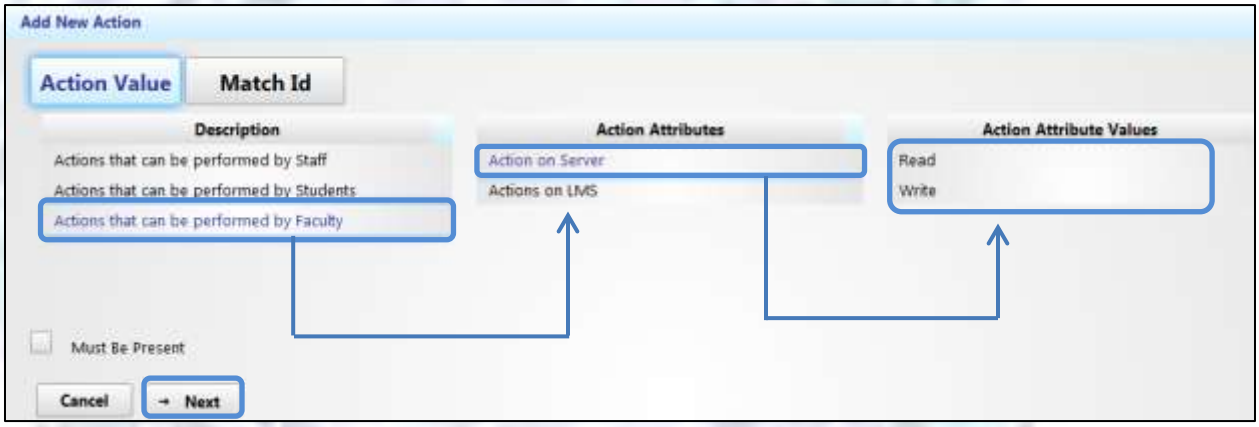
b-3) In the **Match Id** tab, list of possible match ids for the previously selected Resource value is presented. Select any match Id value from the available list and click **Save** to add the selection (**Resource Value** and **Match Id**) against the individual Target.



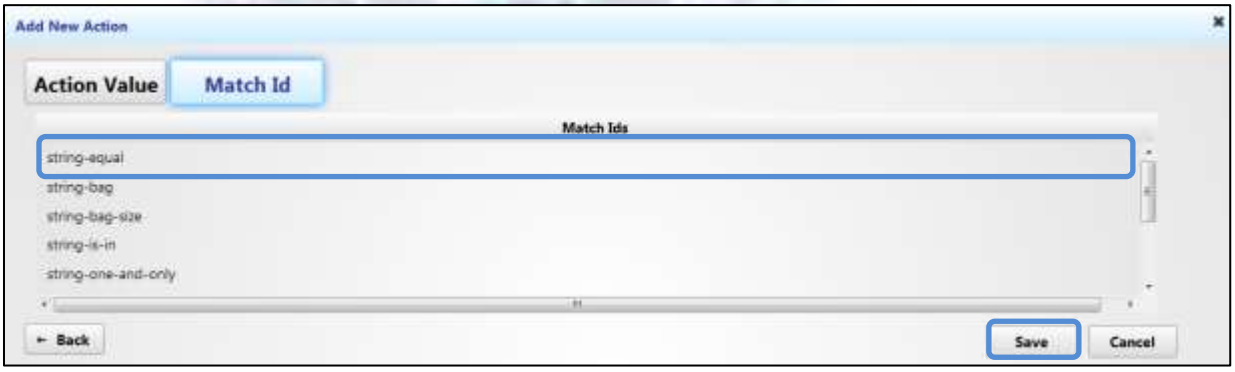
c-1) Click on "+" option to add/update **Available Action** against the selected Target attribute. In the **Action Value** tab, select action **Description** from the available list. As a result of this selection, list of available Action Attributes is displayed.



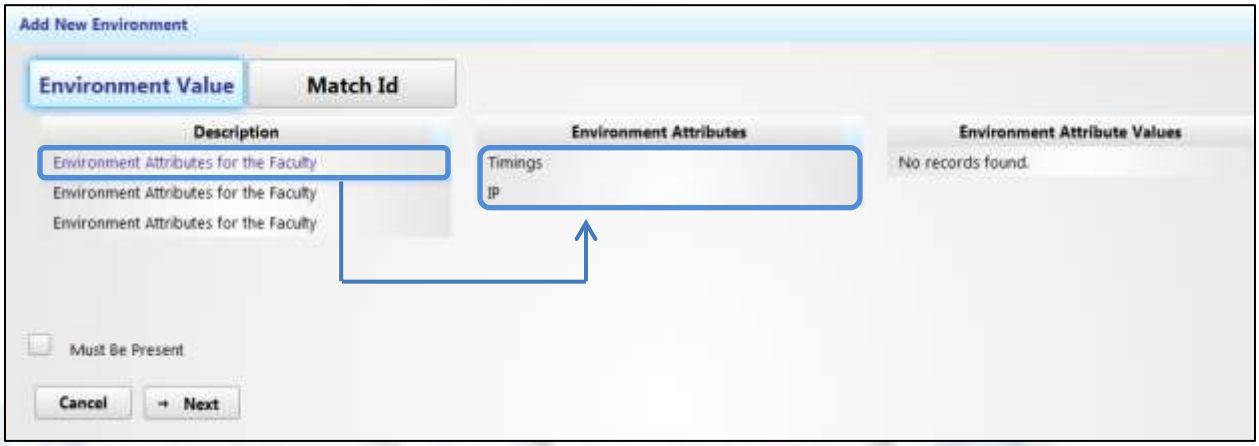
c-2) Click on any of the **Action Attribute** from the available list to view its values. As a result, a complete list of possible values is displayed under **Action Attribute Values** tab, select any particular value and click **Next.**



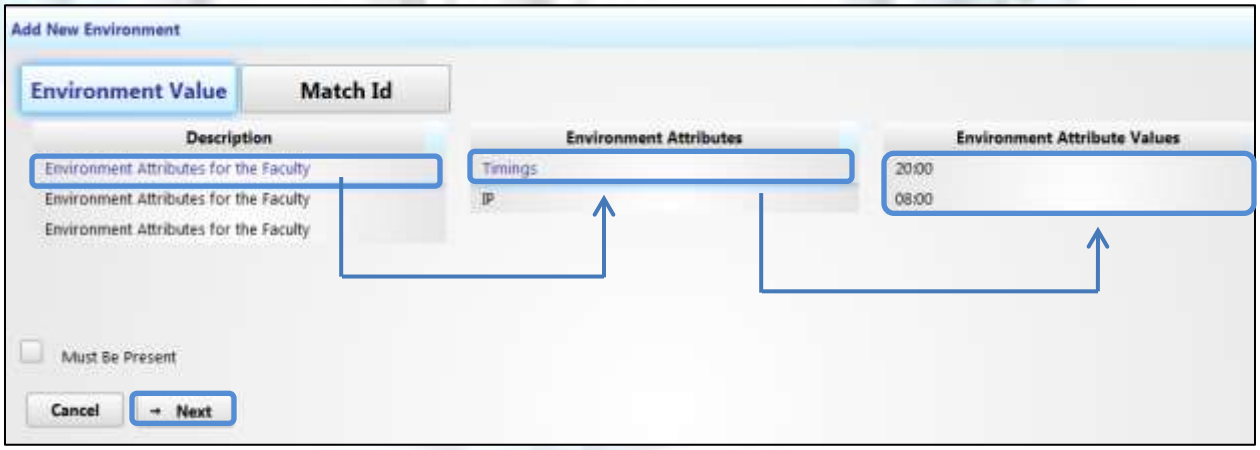
c-3) In the **Match Id** tab, list of possible match ids for the previously selected Action Value is presented. Select any match Id value from the available list and click **Save** to add the selection (**Action Value** and **Match Id**) against the individual Target.



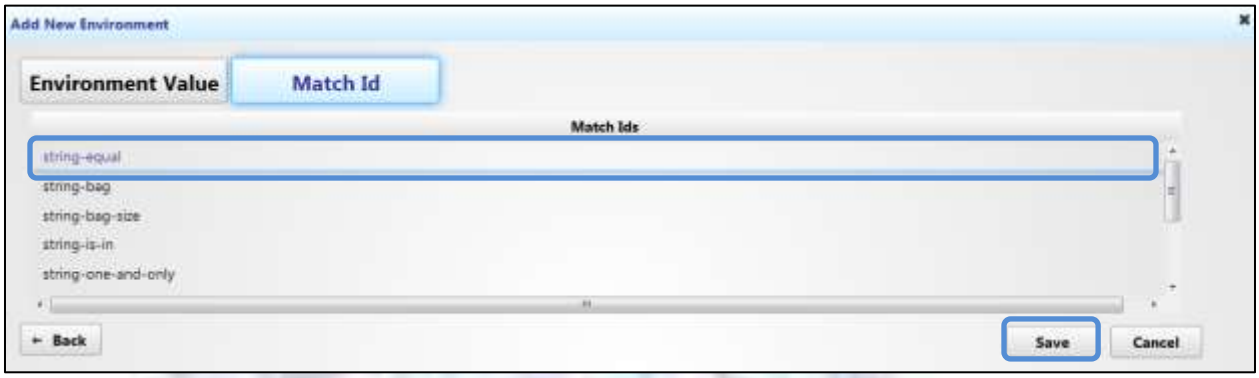
d-1) Click on "+" option to add/update **Available Environment** against the selected Target attribute. In the **Environment Value** tab, select Environment **Description** from the available list. As a result of this selection, list of available Environment Attributes is displayed.



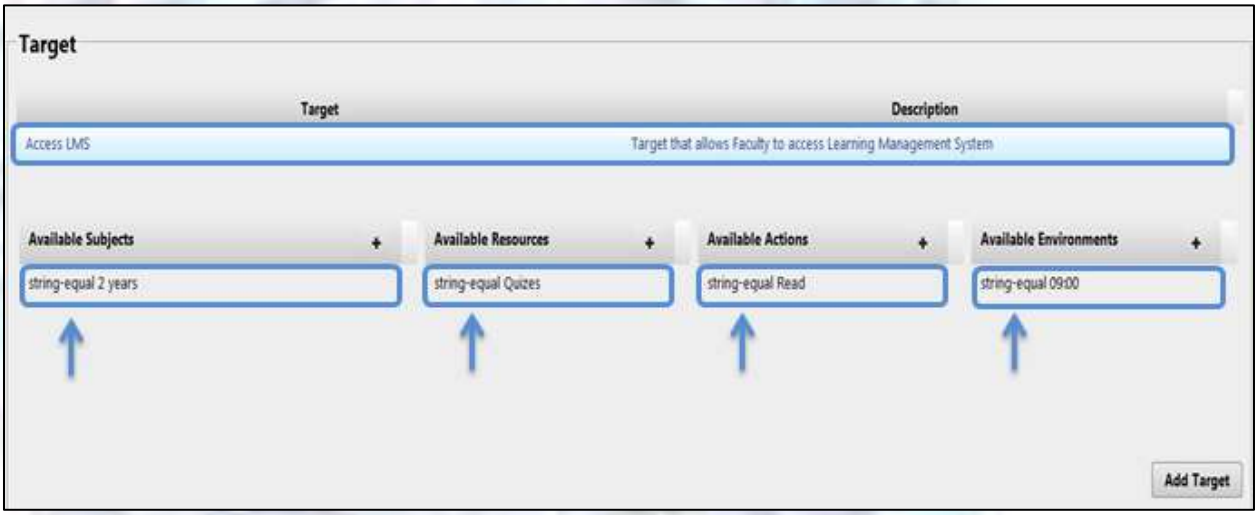
d-2) Click on any of the **Environment Attribute** from the available list to view its values. As a result, a complete list of possible values is displayed under **Environment Attribute Values** tab, select any particular value and click **Next.**



d-3) In the **Match Id** tab, list of possible match ids for the previously selected Environment Value is presented. Select any match Id value from the available list and click **Save** to add the selection (**Environment Value** and **Match Id**) against the individual Target.



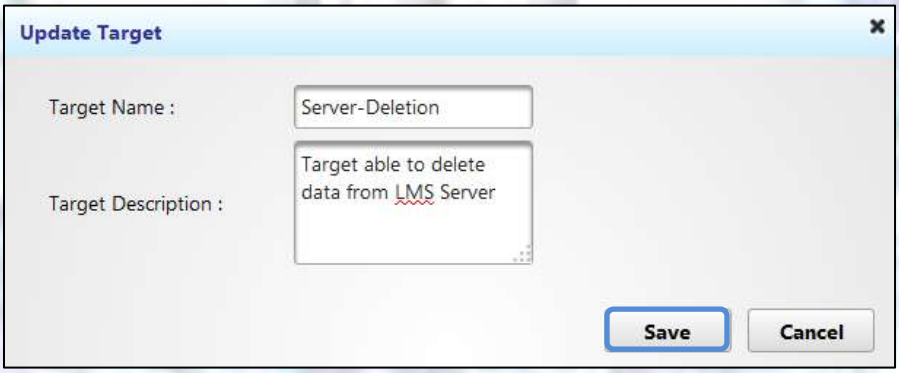
6. After adding all the attributes, select the updated **Target** from the main **Target** interface to view all of its associated **Subjects, Actions, Resources and Environments**.



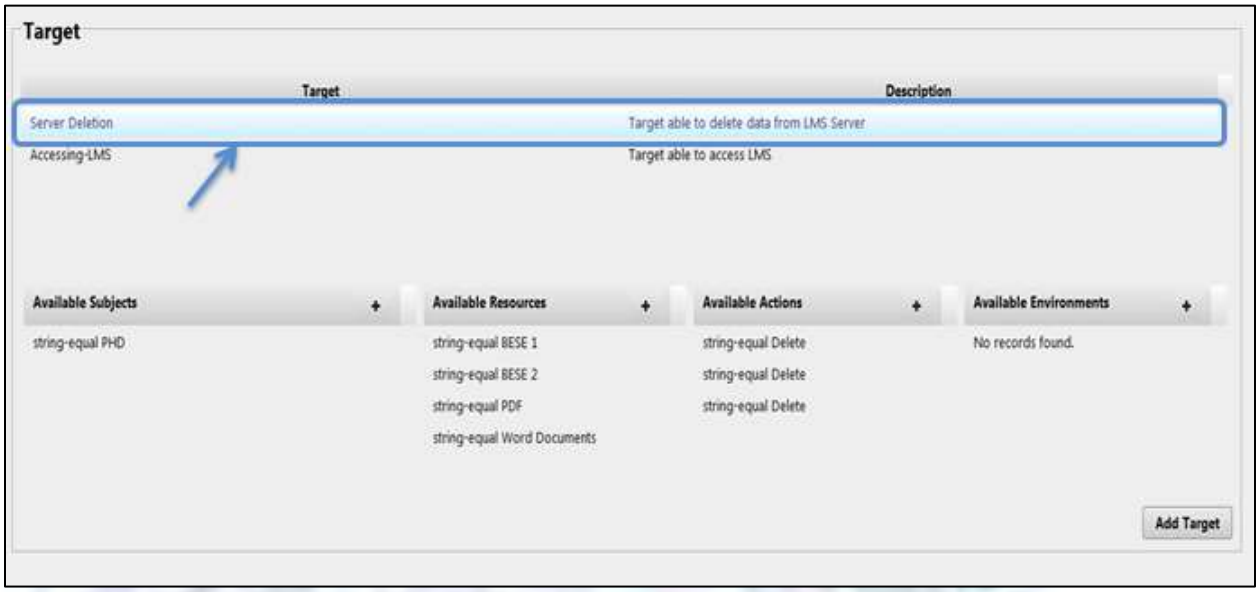
MT - 2: Update Target

1. In order to update any existing **Target** attribute, right click on that specific Target and choose **Update Target** from the drop-down menu.

2. In the **Update Target** interface, edit any of the previously added Target attribute and click **Save** to save the changes into the database.



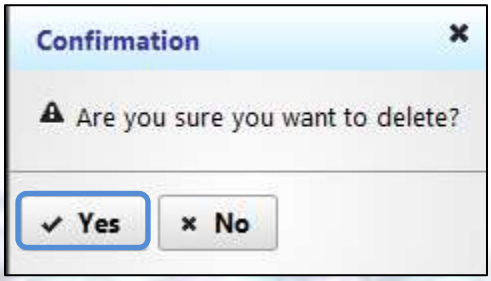
3. After the successful execution of update function, **Target** interface displays the list of updated Target attributes.



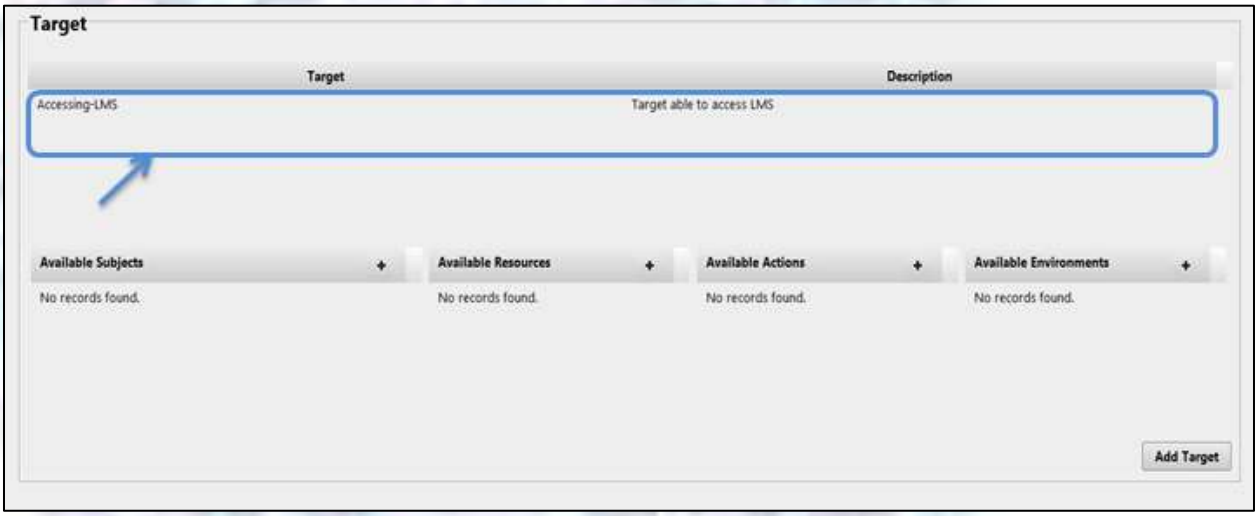
MT - 3: Delete Target

1. In order to **Delete** any of the existing **Target**, right click on that particular Target and select **Delete** from the menu.

2. Click on **Yes** to confirm deletion in the confirmation Dialog box:

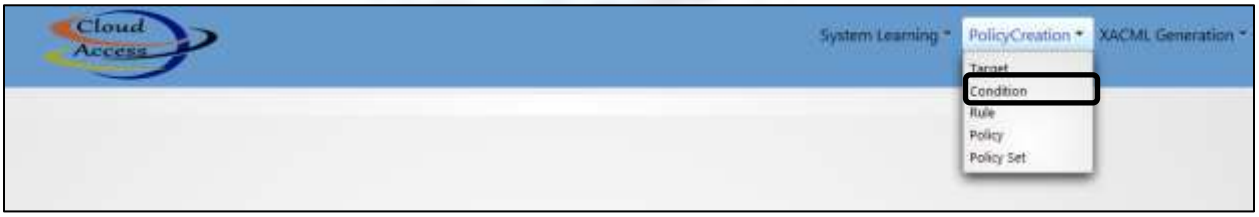


3. After the successful deletion of selected **Target**, updated list of available Target attributes is displayed on the **Target** interface.



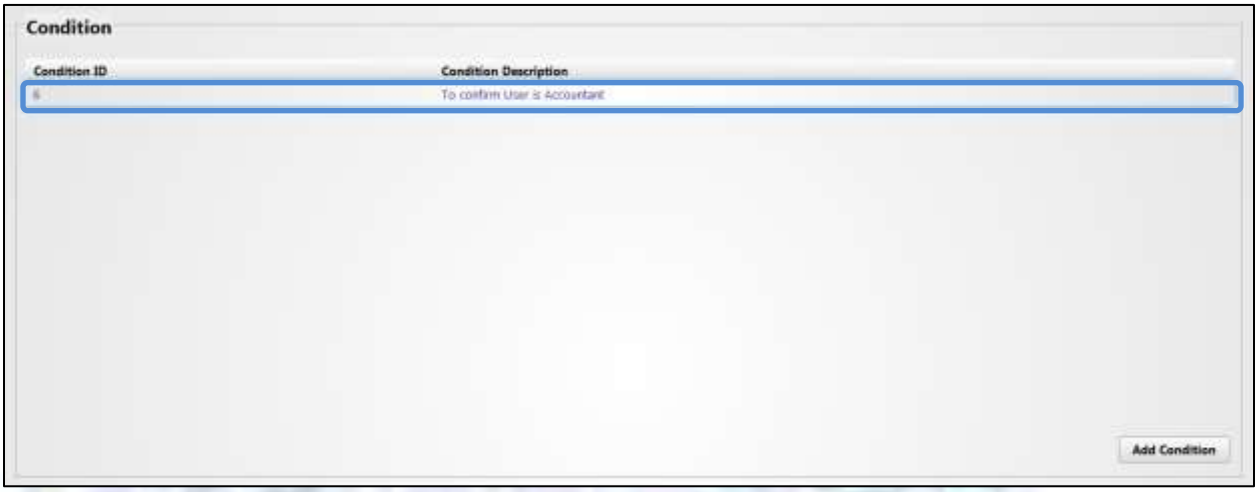
PC - 2. Manage Condition:

In order to manage the Condition, select the **Condition** from the main **Policy Creation** dropdown- menu.



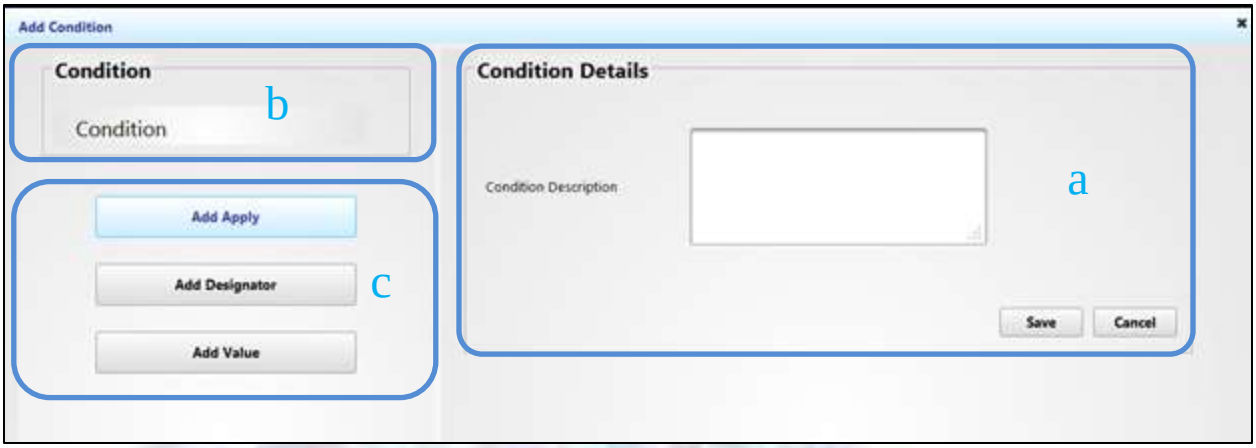
PC - 1. Create Condition:

1. Below is the main interface of **Condition**, which is used to create and delete the Condition.

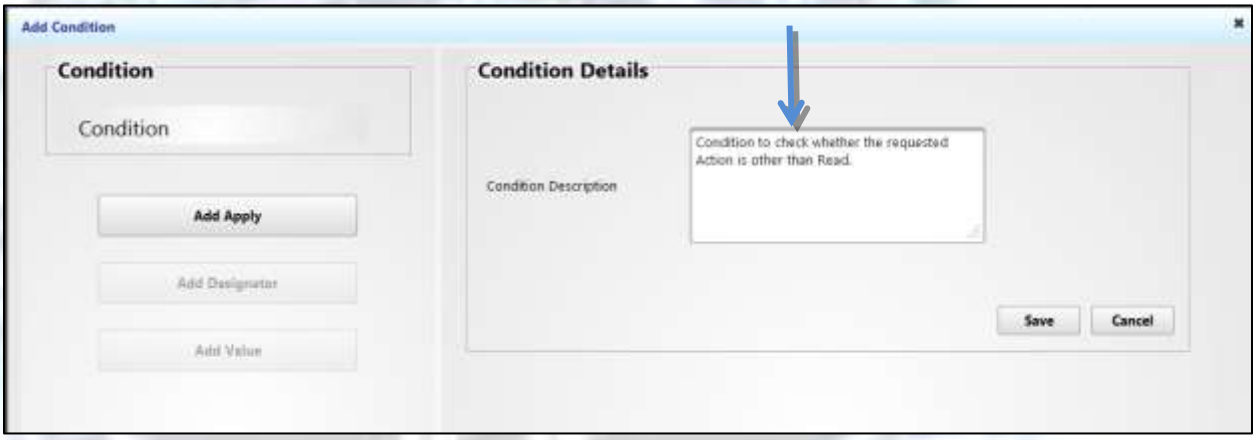


2. Click on the **Add Condition** button to create the new Condition.

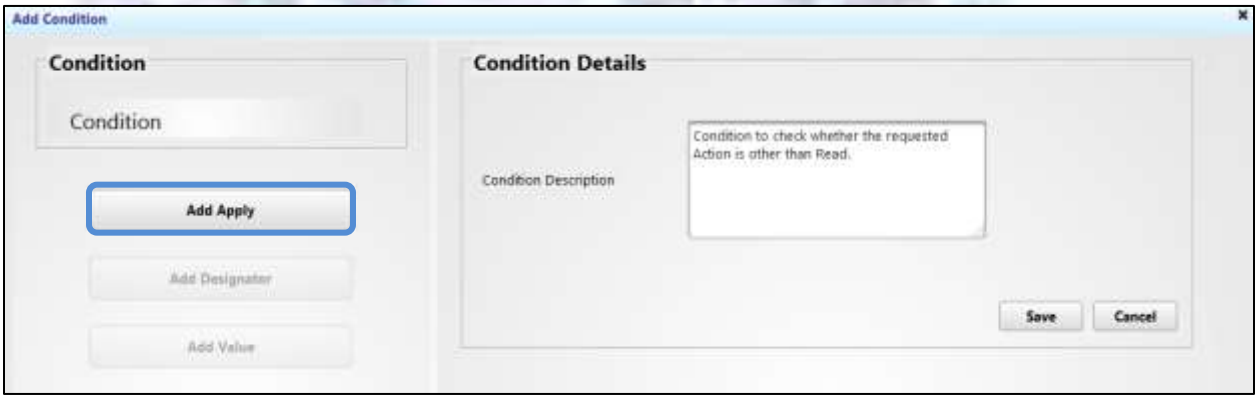
3. The **Add Condition** dialog is categorized in three sections:
   a) The first section (a) contains the information about Condition i-e, its Description,
   b) The second section (b) contains the tree that represents the current state of Condition. The new Attributes of Conditions are added as nodes in the tree, whenever an Apply, Designator or Value is added this tree is updated accordingly.
   c) The third section (c) contains the controllers to add new attributes (Apply, Designator, or Value) to the Condition.



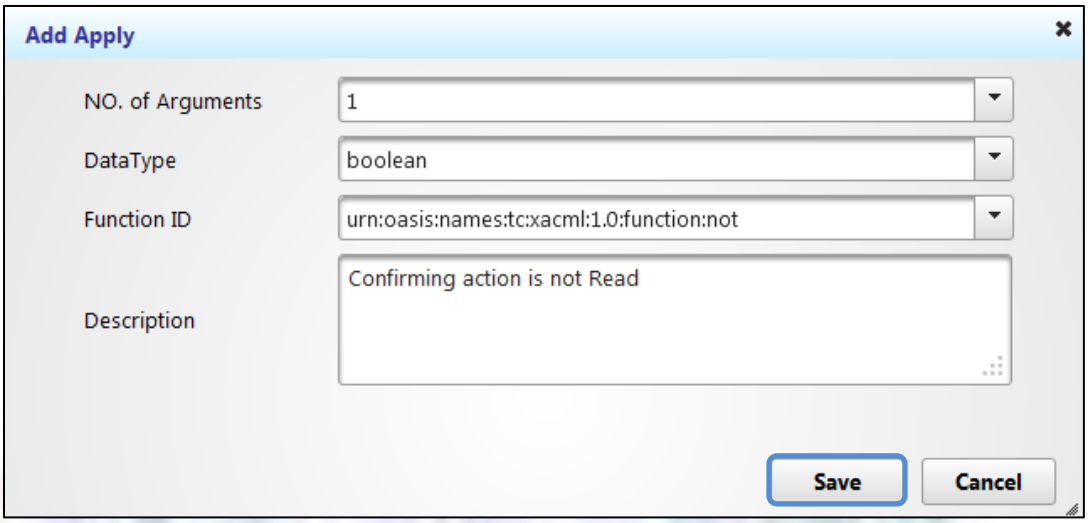
4. Provide the Description of the Condition in **Condition Description** section.



5. Click the **Add Apply** button to add the Apply in the condition.

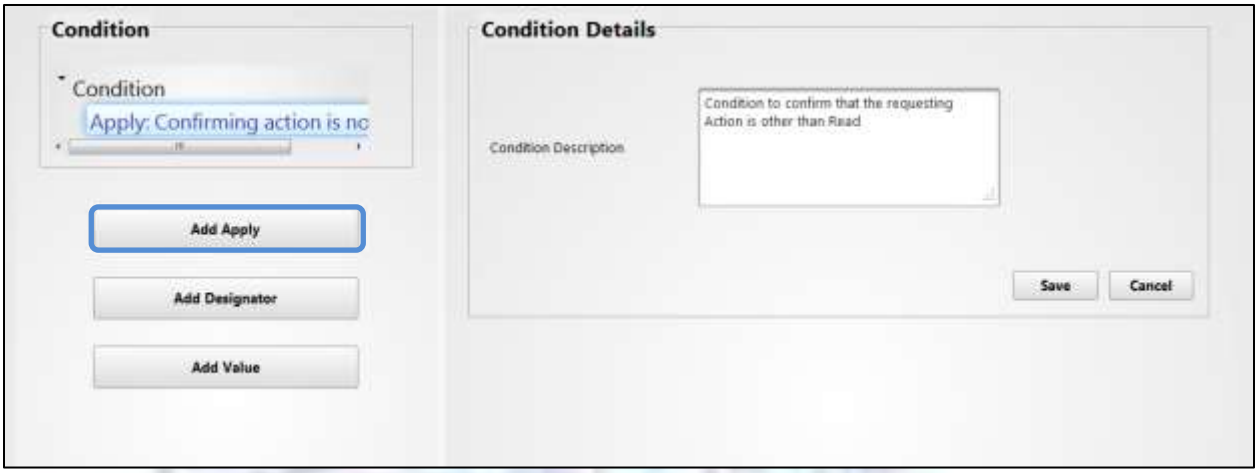


6. The Add Apply dialog will open, fill the required information, by selecting the **Function ID**, **No. of Arguments** for the function, **Description**, and **DataType,** click **Save** for saving the Apply.

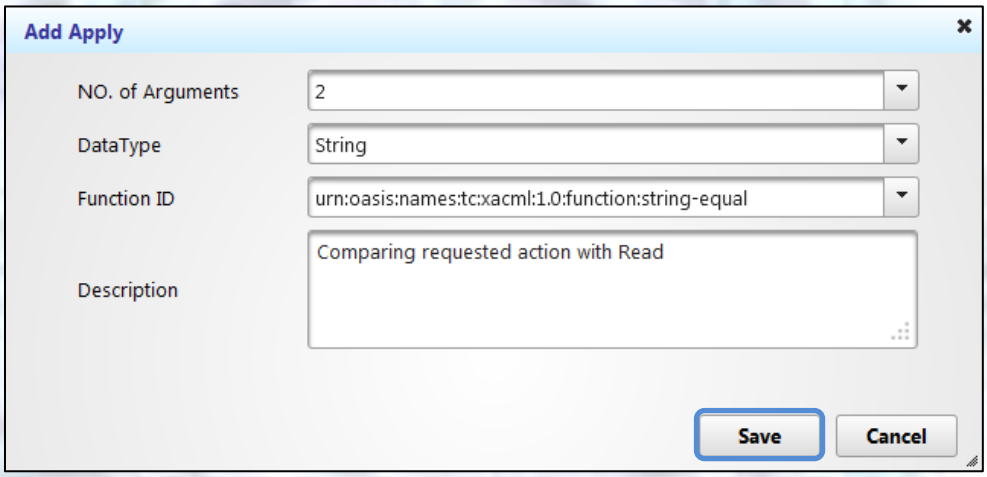


7. The newly added Apply is added under the Condition in the tree (section b of **AddCondition** interface).

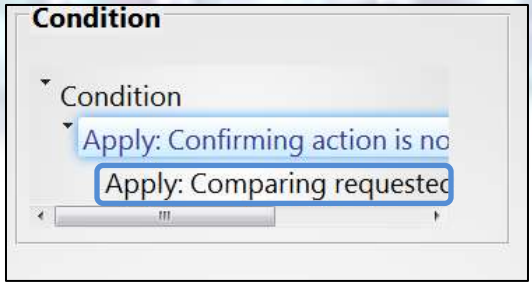
8. Now select the Apply in the Condition tree and Click on **Add Apply** to create inner Apply, this apply will accept the Requestor's time as an argument.



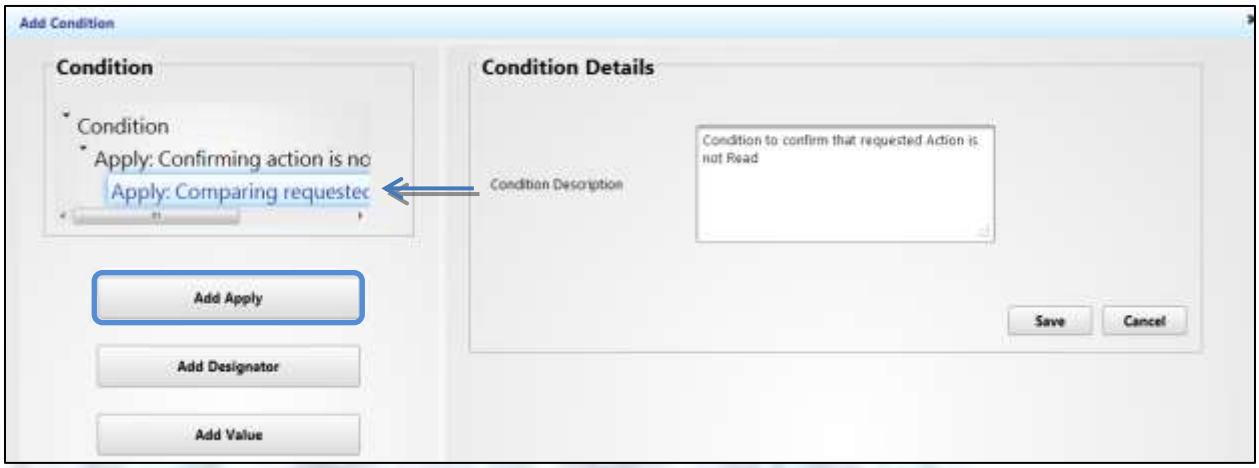
9. Fill the required information and click Save.



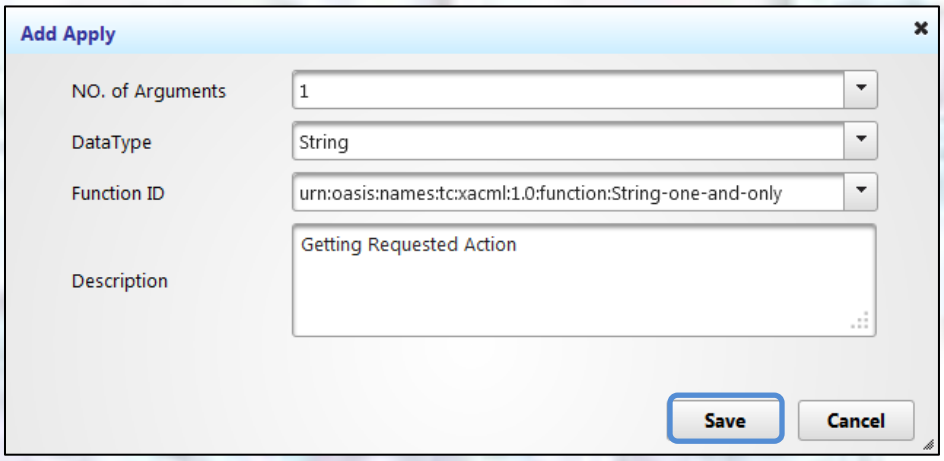
10. The Condition tree is updated accordingly, showing the newly added **Apply**.



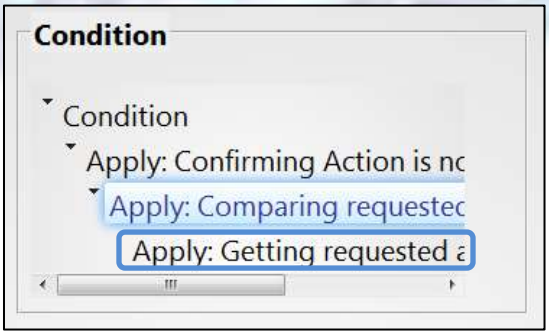
11. Now select the newly added apply, and click on **Add Apply** button again to add another Apply.



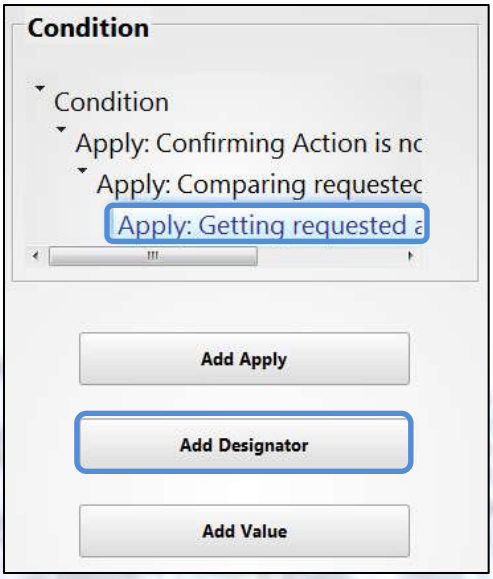
12. Fill the required information and click **Save**.



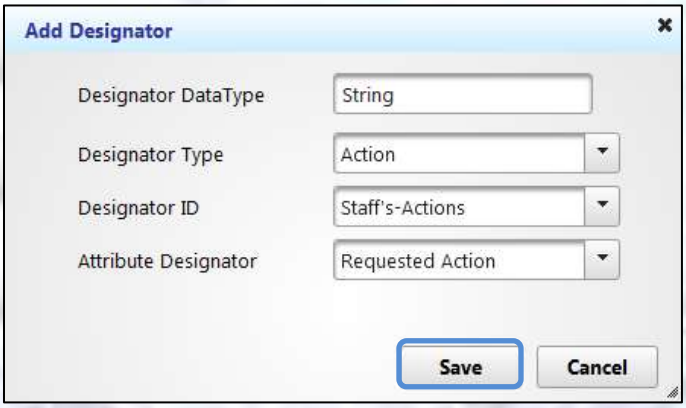
13. The condition tree is updated accordingly, showing the newly added **Apply**.



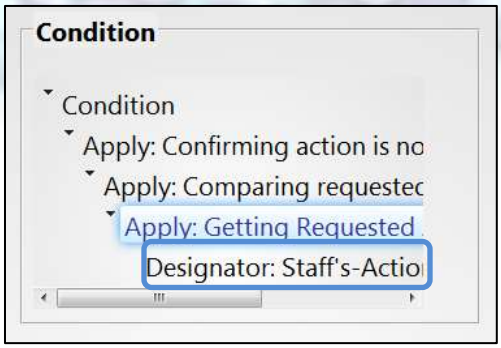
14. Now select the newest Apply, click on **Add Designator**.



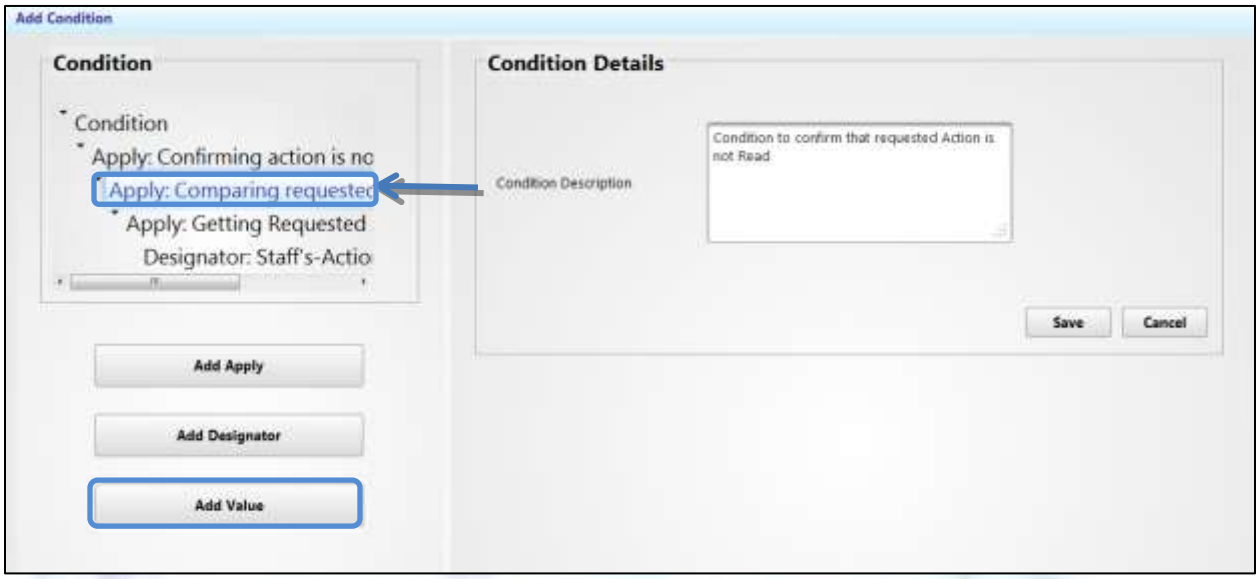
15. Select the desired **Designator Type**, **Designator ID** and **Attribute Designator** from the drop downs and click **Save**.



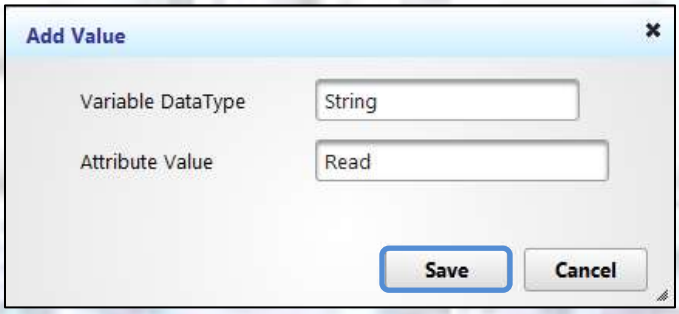
16. The tree is updated accordingly, showing the newly added **Designator**.



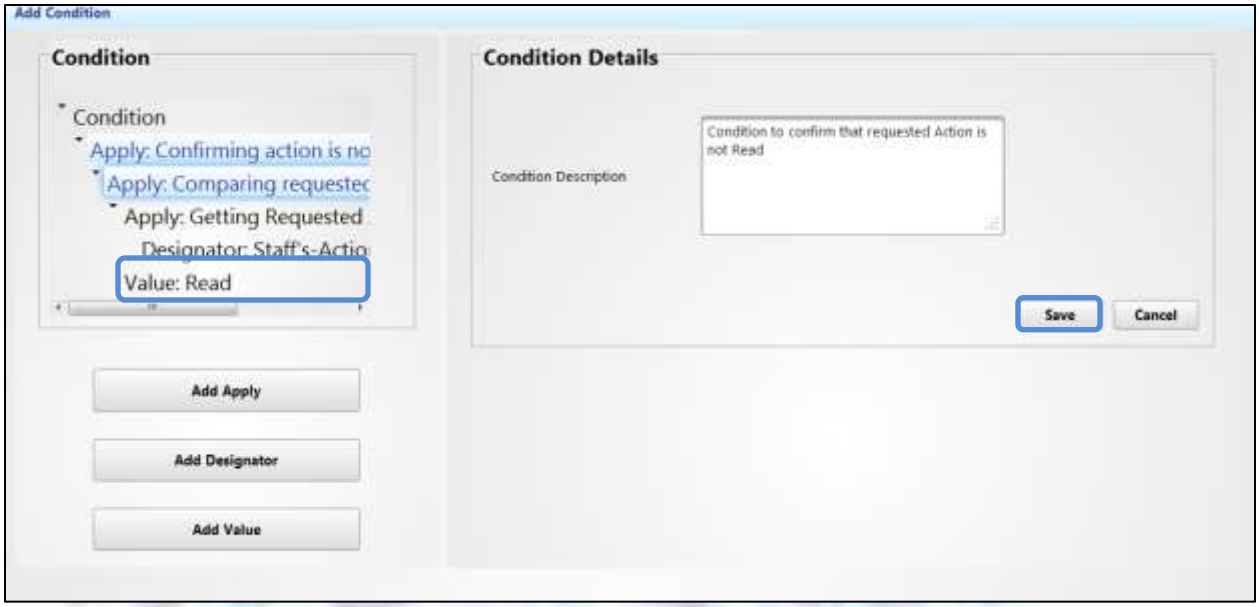
17. Now select the second Apply from the tree, and click on **Add Value** to provide the value of action.



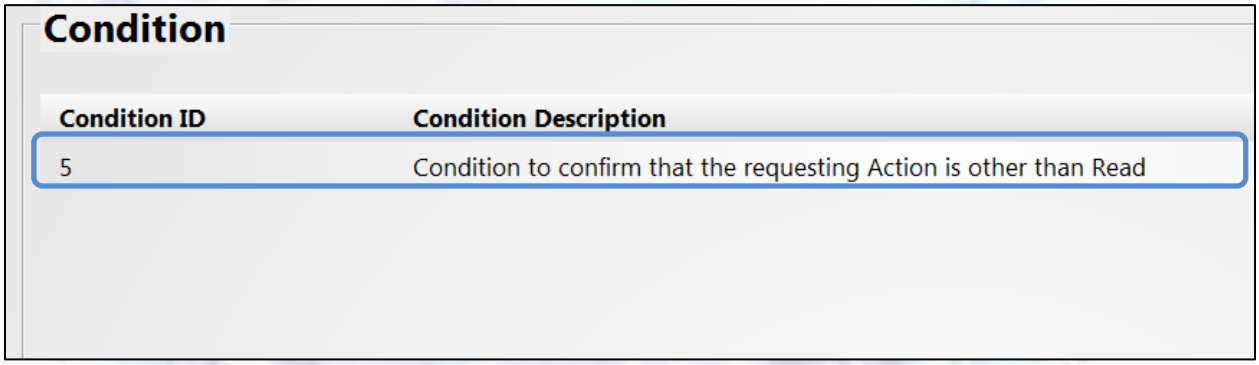
18. Fill the appropriate information and click **Save.**



19. Once completed click on **Save**, to save the condition.

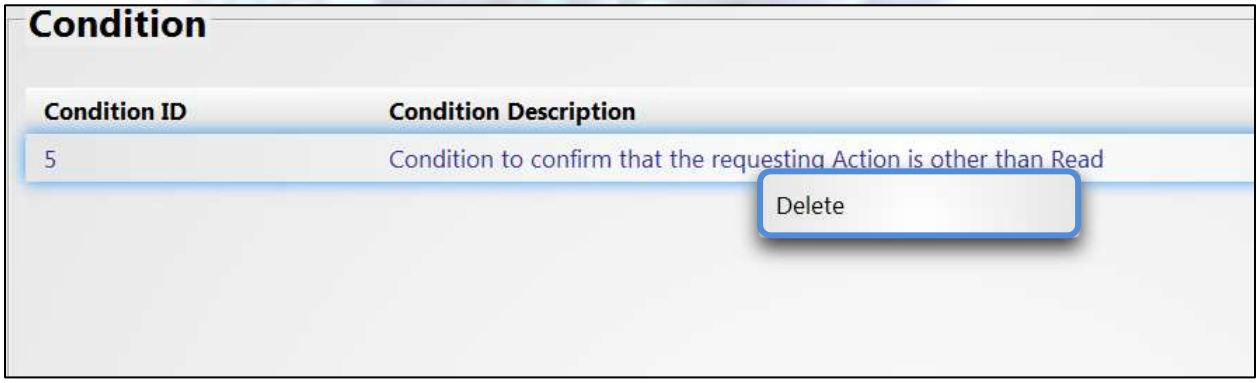


20. Once saved, the newly created Condition appears in the main **Condition** page.

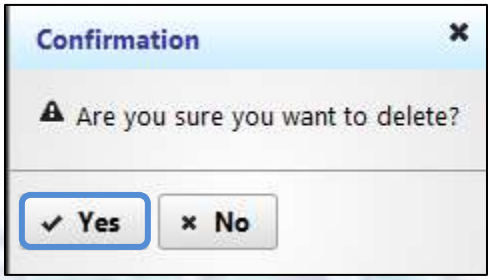


PC - 2. Delete Condition:

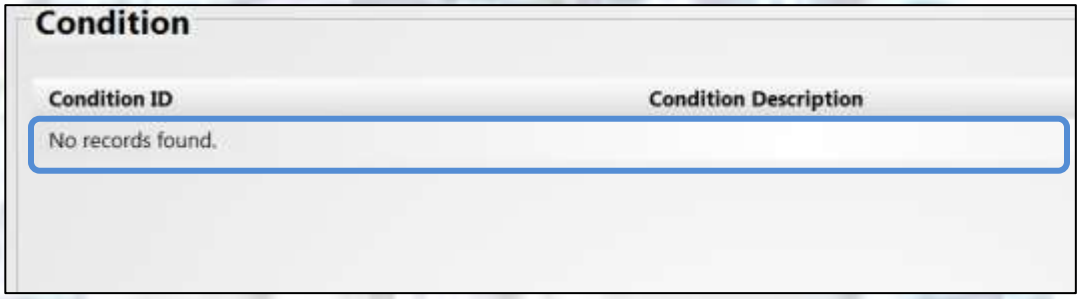
1. For deleting the Condition, right click on the desired condition and select Delete from the Menu:



2. Click **Yes** in the confirmation Dialog box:



3. The condition will be deleted from the database, and will not be available in the main **Condition** page.

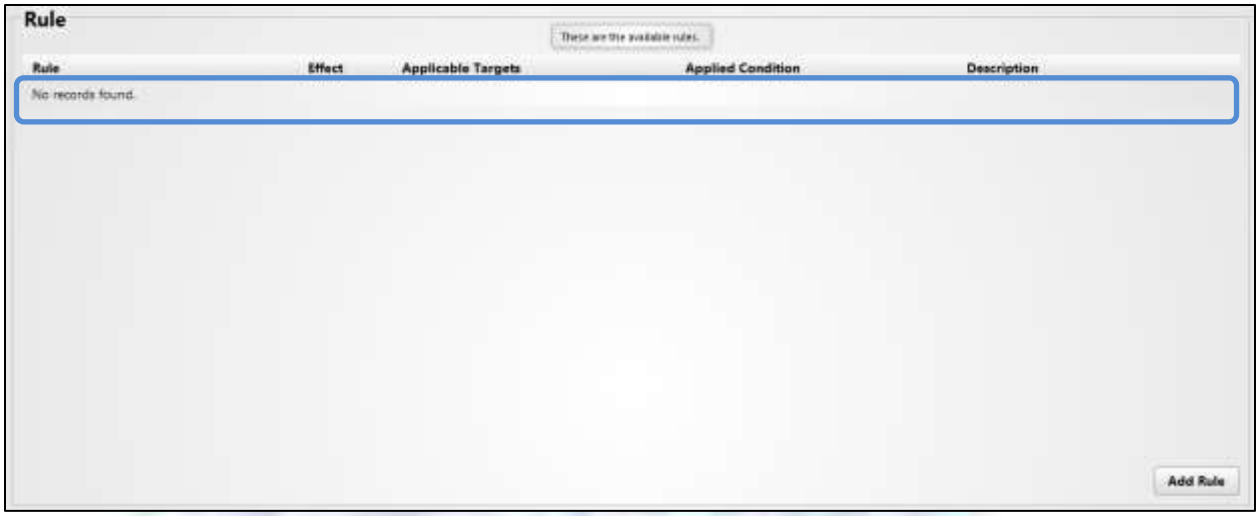


PC - 3. Manage Rule:

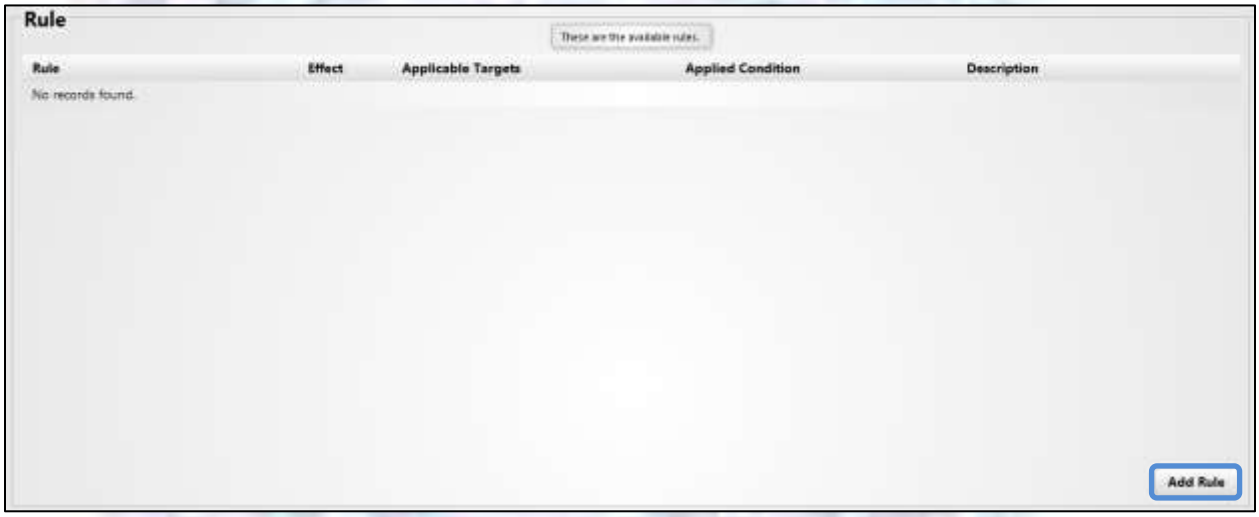
In order to add, update and delete **Rule** and its corresponding Target attribute, select **Rule** from the main **Policy Creation** dropdown-menu.

MU - 1: Create Rule

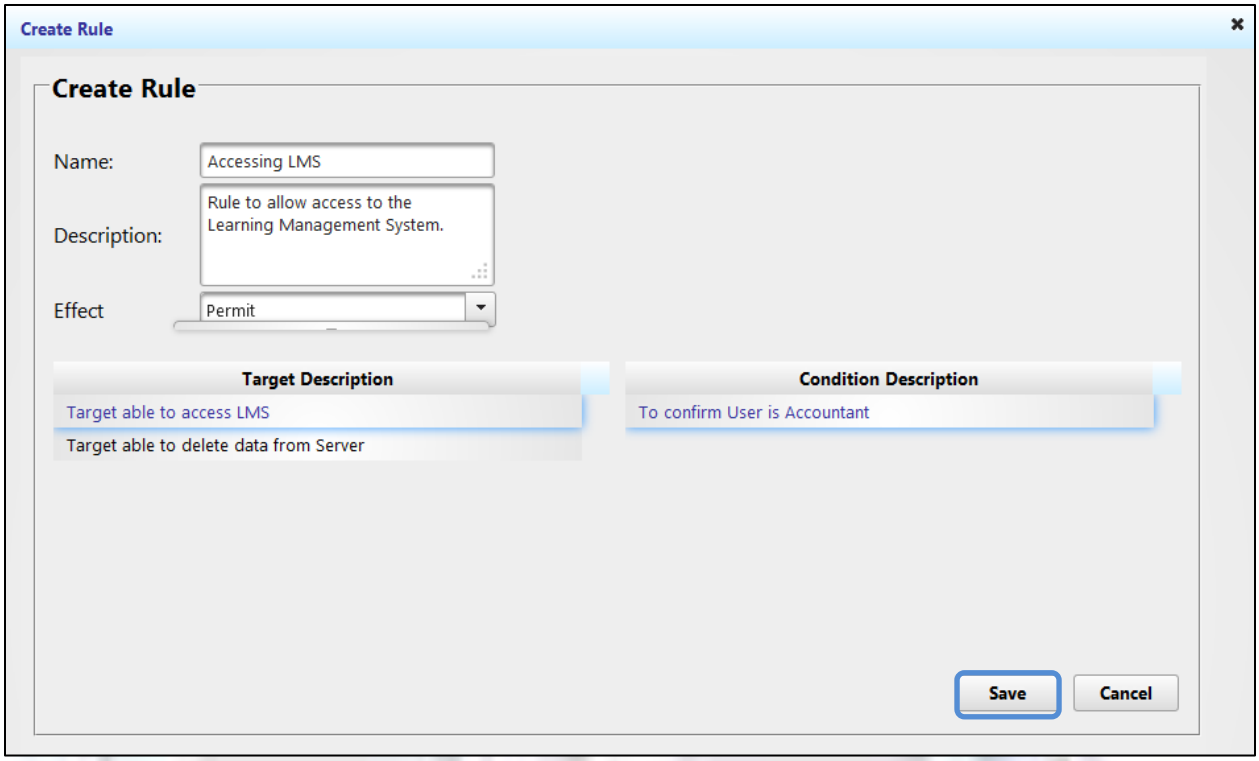
1. Below is the main **Rule** interface, which is used to add, update and delete Rule and its related attributes.



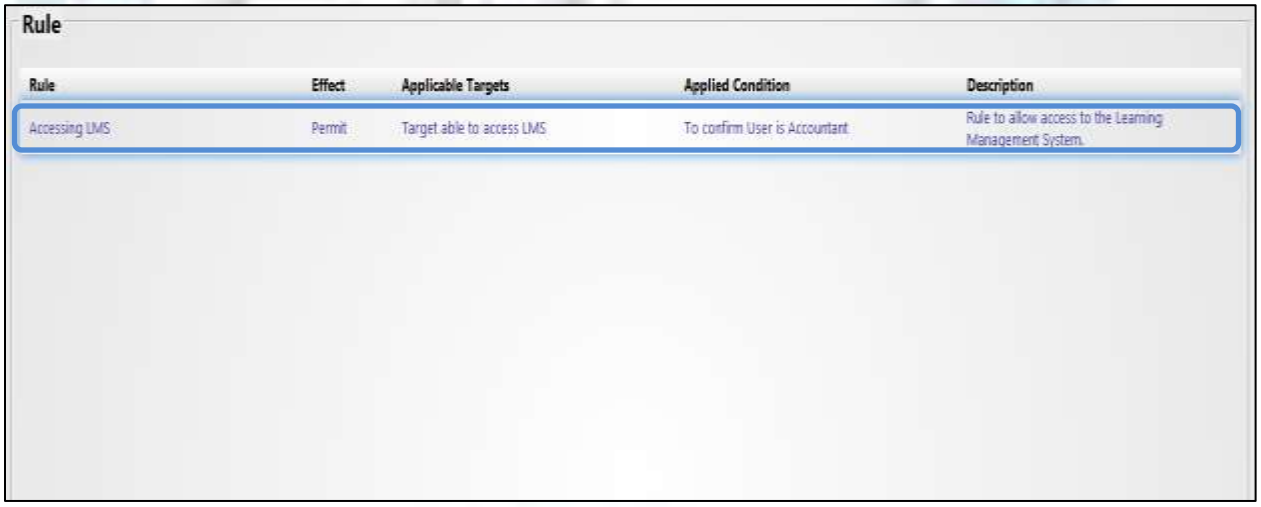
2. Click on **Add Rule** button, to add new Rule attribute into the database.



3. In the **Create Rule** interface, specify Rule Name, Description, its corresponding Effect, the applicable target and the applied condition and click on **Save** to insert the new Rule attribute into the database and **Cancel** to discard the added information.



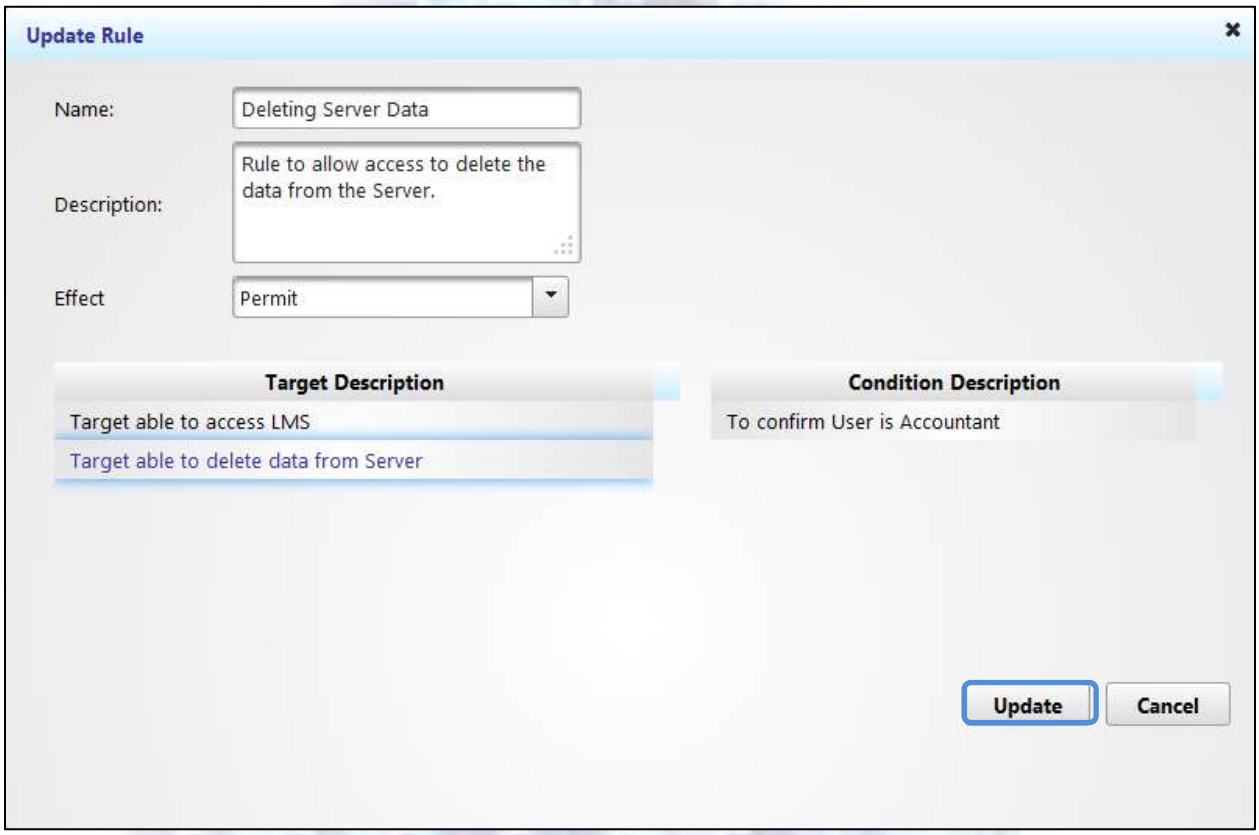
4. Upon successful creation of Rule, its Name, Effect, Applicable targets and Description appears in the main **Rule** interface



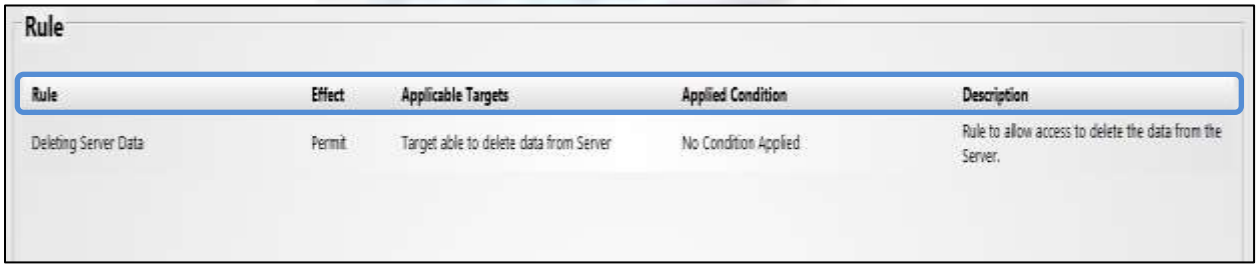
MU - 2: Update Rule

1. In order to update any existing Rule attribute, right click on that specific Rule and choose **Update** from the displayed menu

2. In the **Update Rule** interface, edit any of the previously added Rule attribute and click **Update** to save the changes into the database.

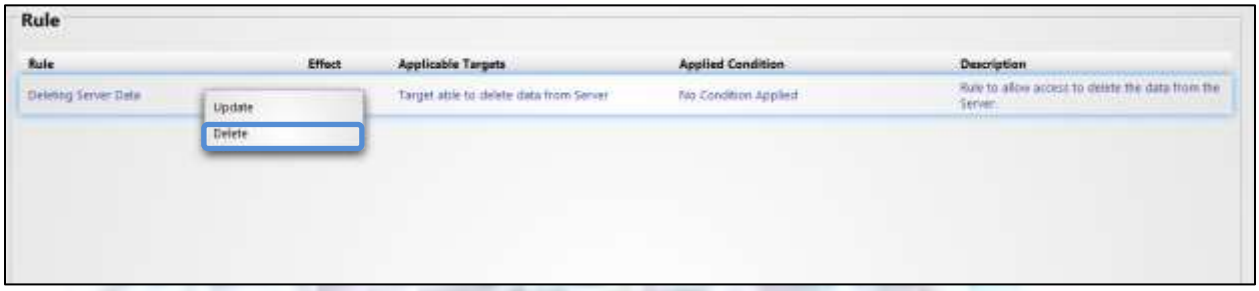


3. After the successful execution of update function, **Rule** interface displays the list of updated Rule attributes.

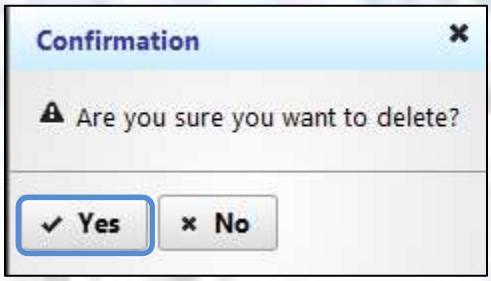


MU - 3: Delete Rule

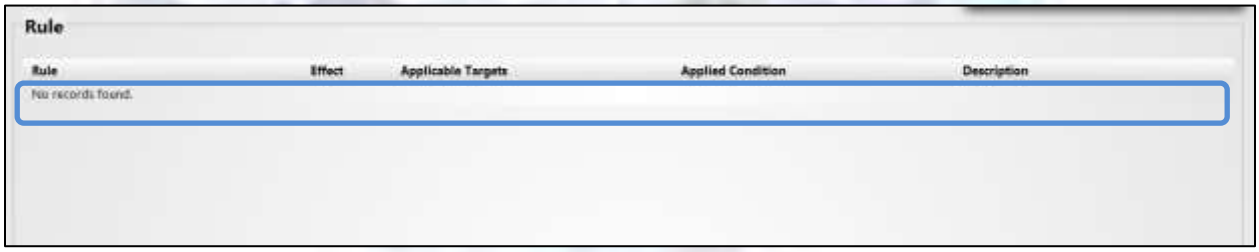
1. In order to **Delete** any of the existing **Rule**, right click on that particular Rule and select **Delete** from the menu.



2. Confirm the deletion by selecting **Yes** in the confirmation dialog box.

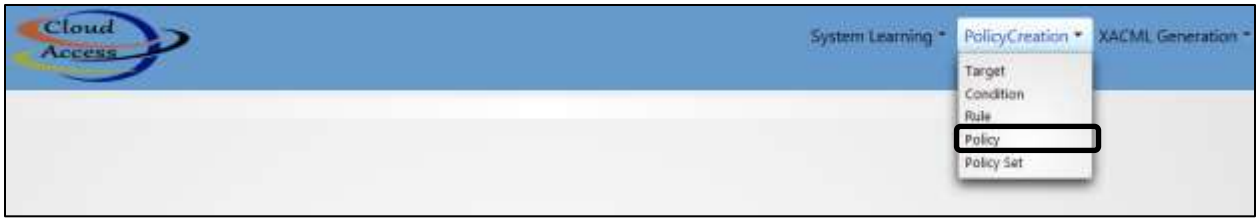


3. After the successful deletion of selected **Rule**, updated list of available Rule attributes is displayed on the **Rule** interface.



PC - 3. Manage Policy:

In order to add, update and delete **Policy** and its related attribute including Target and Rule, select **Policy** from the main **Policy Creation** dropdown-menu.

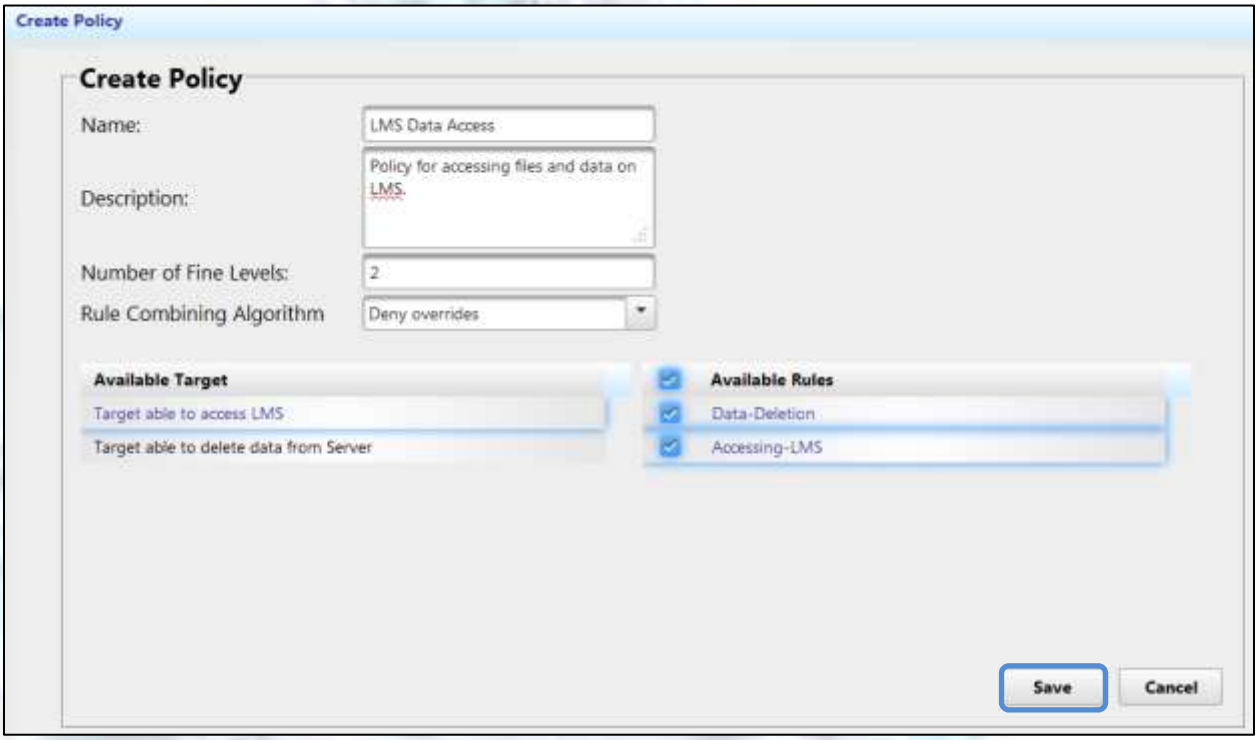


MP - 1: Create Policy

1. Below is the main **Policy** interface, which is used to add, update and delete Policy and its related attributes.

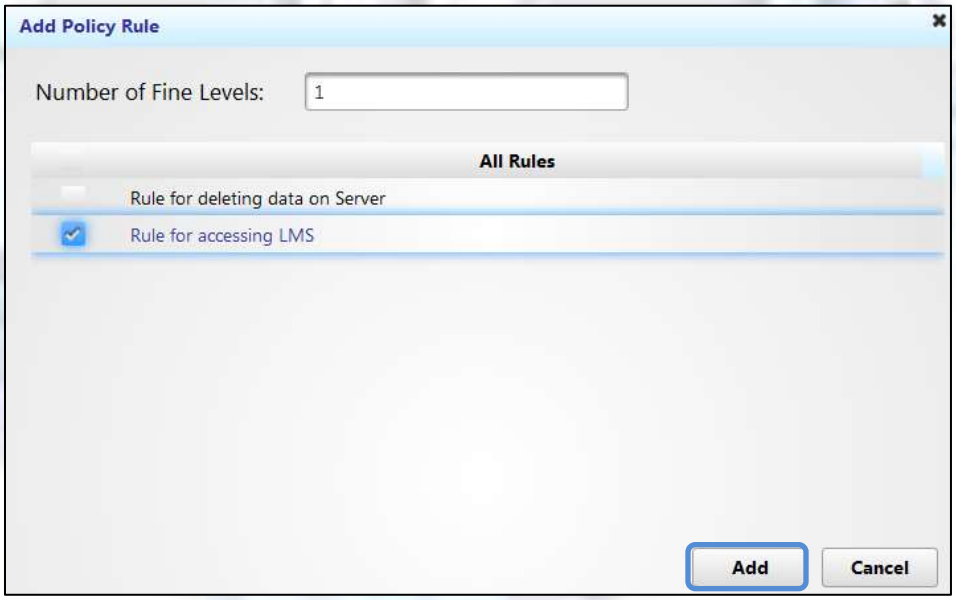
2. Click on **Add Policy** button, to add new Policy attributes into the database.

3. In the **Create Policy** interface, specify **Policy Name, Description, Rule combining Algorithm** along with the desired Target attribute and their corresponding Rules. Also provide **Number of Fine Levels** that is the number of restriction desired to be applied on the Policy. Make sure that Fine Levels provided and number of Rule selected is same. Click on **Save** to insert the new Policy attribute into the database.



4. The Policy Name, Description, Rule Combining Algorithm and Applicable Target is shown in the **Policy** interface. Selecting any Policy from the available list enables "+" option that is used for editing the number of fine levels and **Applicable Rules** on the selected Policy.

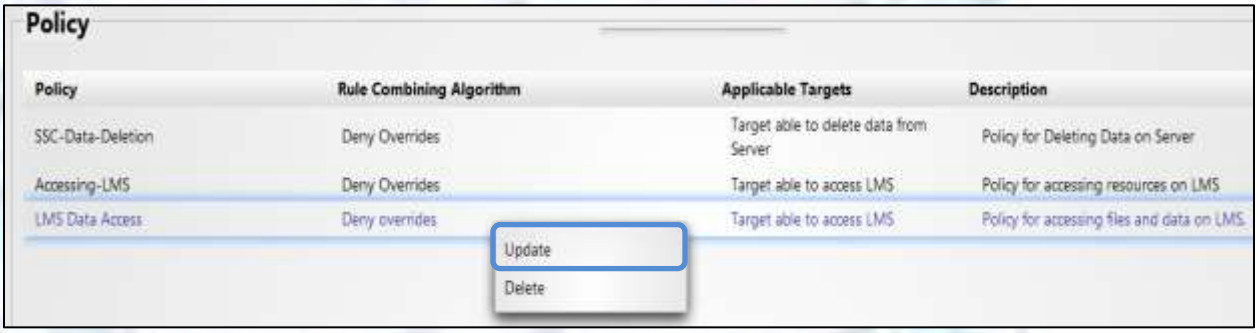
5. After clicking on "+" option to edit **Applied Rules** or change the **Number of Fine Levels** on the selected Policy. In the **Add Policy Rule** interface, Check/select the Rule description that you want to add to the selected Policy, or/ and change the **Number of Fine Levels**, again make sure that Fine Levels defined and number of selected Rules are equal and click **Add** to save the association in the database.



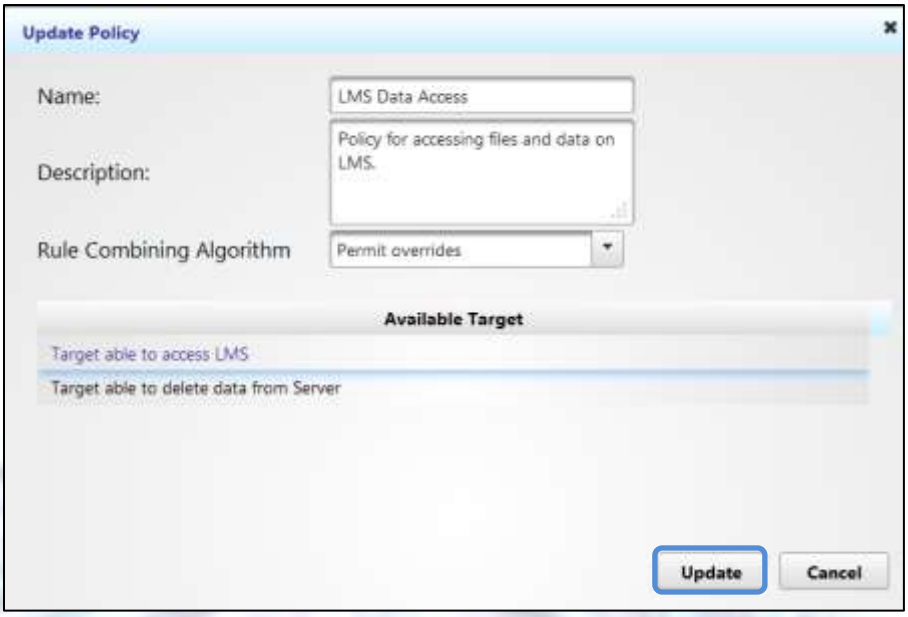
6. If saved, newly added **Applicable Rules** appear in the main **Policy** interface against the selected Policy.

MP - 2: Update Policy

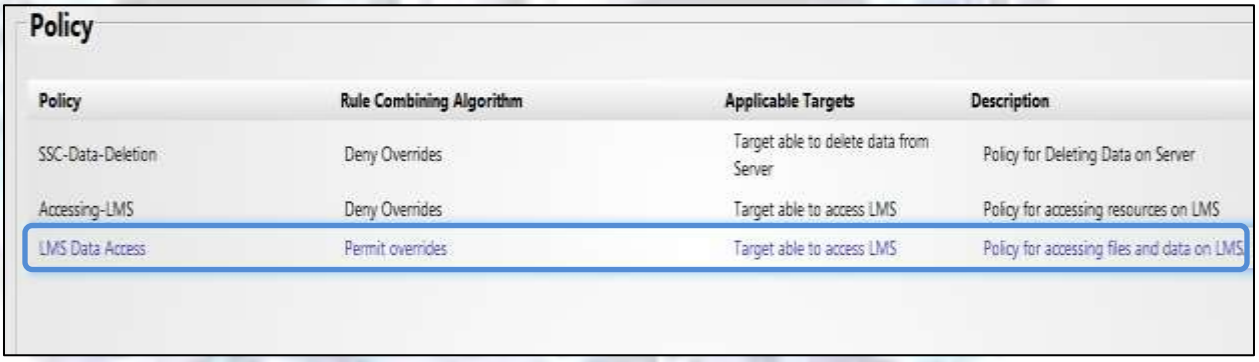
1. In order to update any of the existing **Policy**, right click on that specific Policy and choose **Update** from the displayed menu.



2. In the **Update Policy** interface, edit any of the previously added Policy attribute and click **Update** to save the changes into the database

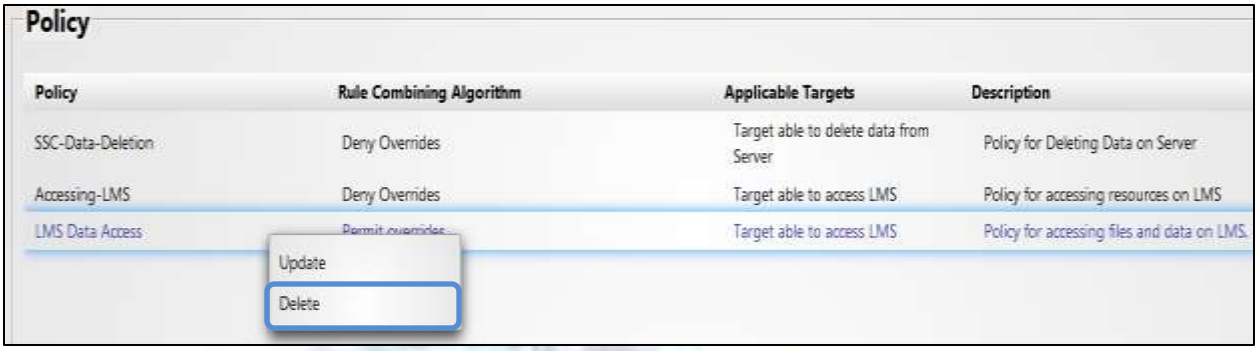


3. After the successful execution of update function, **Policy** interface displays the list of updated Policy attribute.

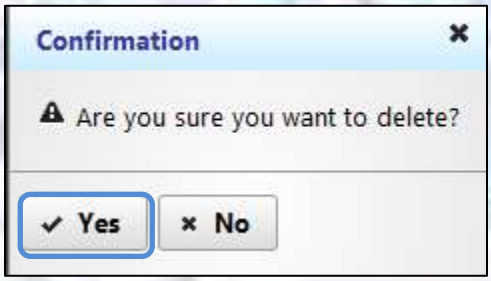


MP - 3: Delete Policy

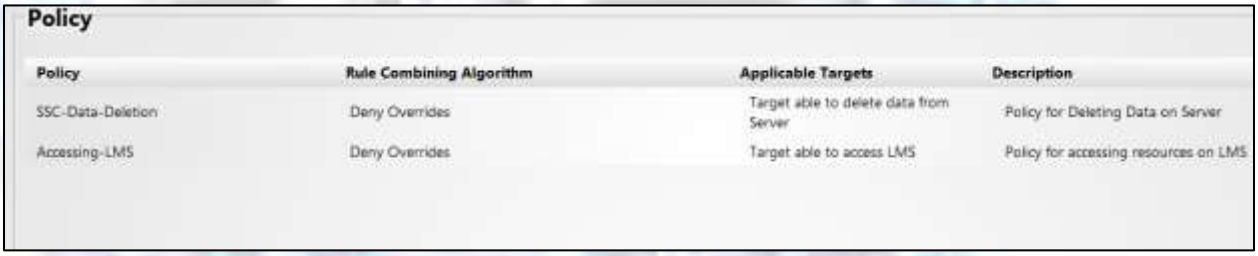
1. In order to **Delete** any of the existing **Policy**, right click on that particular Policy and select **Delete** from the menu.



2. Click **Yes** to confirm the deletion in the confirmation Dialog box.



3. After the successful deletion of selected **Policy**, updated list of available Policy attribute is displayed on the **Policy** interface.

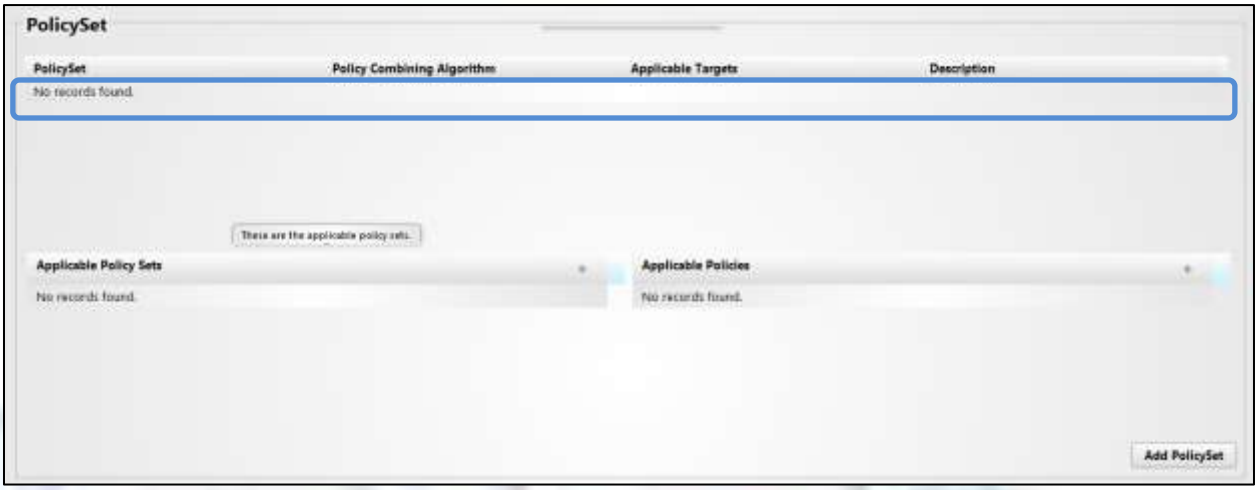


PC - 4. Manage Policy Set:

In order to add, update and delete **Policy Set** and its related attribute including Target, Rule and Policy, select **Policy Set** from the main **Policy Creation** dropdown-menu.

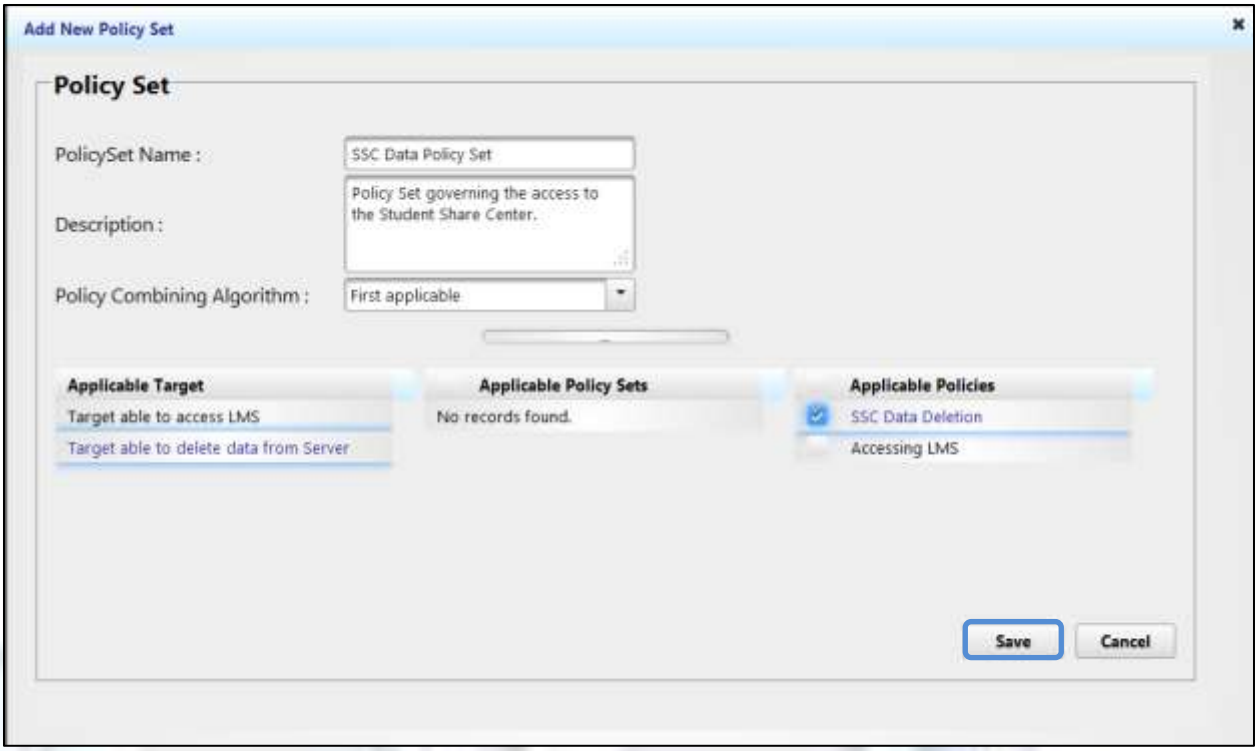
MPS - 1: Create Policy Set

1. Below is the main **Policy Set** interface, which is used to add, update and delete Policy Set and its related attribute.



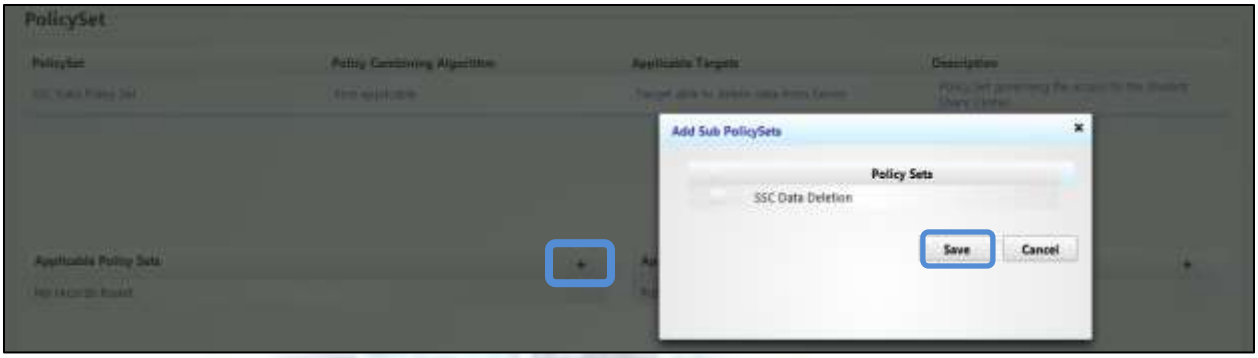
2. Click on **Add Policy Set** button, to add new Policy Set attribute into the database.

3. In the **Add New Policy Set** interface, specify **PolicySet Name, Description, Policy Combining Algorithm** along with the applicable Target. It provides the provision to add applicable Policies and Policy Sets into the newly created Policy Set. Click **Save** to insert the new Policy Set attribute into the database.

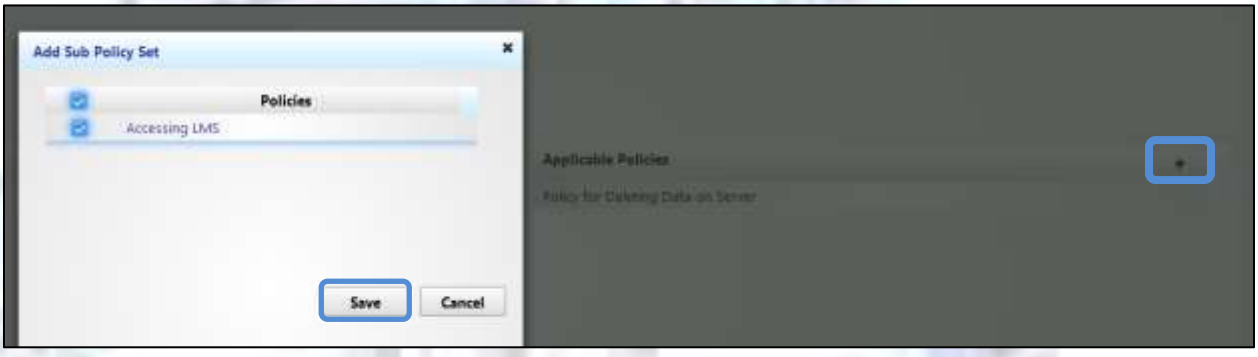


4. After the successful creation of **PolicySet**, newly added Policy Set with all of its related attributes will be displayed in the main **PolicySet** interface. Selecting any Policy Set from the available list enables the add/update "+" option for **Applicable Policy Sets** and **Applicable Policies**.

a) Click on "+" option to update the **Sub PolicySets** attribute against any selected **Policy Set.**



b) Click on "+" option to update the **Sub Policy** attribute against any selected **Policy Set.**

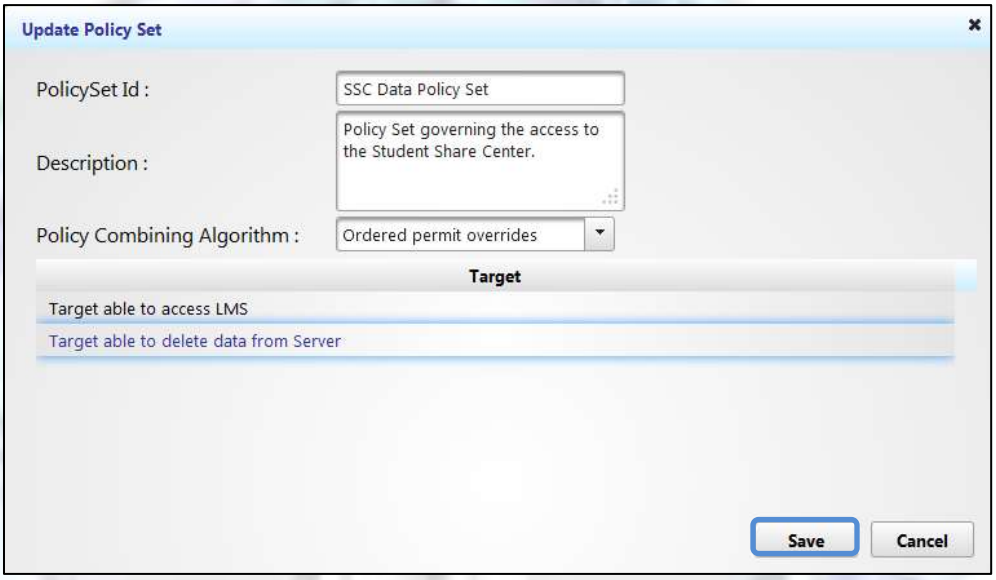


5. If saved successfully, newly added **Policy Set** with **Applicable Policies** will be displayed in the main **Policy Set** interface against the selected Policy Set.

MPS - 2: Update Policy Set

1. In order to update any of the existing **Policy Set**, right click on that specific Policy Set and choose **Update** from the displayed menu.

2. In the **Update Policy Set** interface, edit any of the previously added Policy attribute and click **Update** to save the changes into the database.



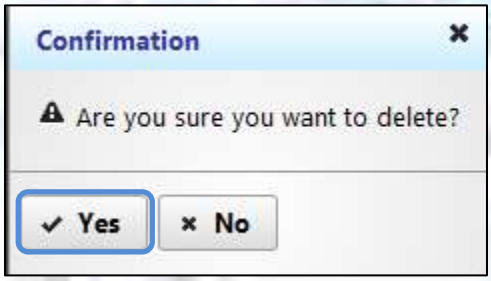
3. After the successful execution of update function, **Policy Set** interface displays the list of updated Policy Set attribute.

PolicySet
Policy Combining Algorithm
Applicable Targets
Description
SSC Data Policy Set
Ordered permit overrides
Target able to delete data from Server
Policy Set governing the access to the Student Share Center.
SSC Data Deletion
Only one applicable
Target able to delete data from Server
Policy Set for Delete Permission on Server

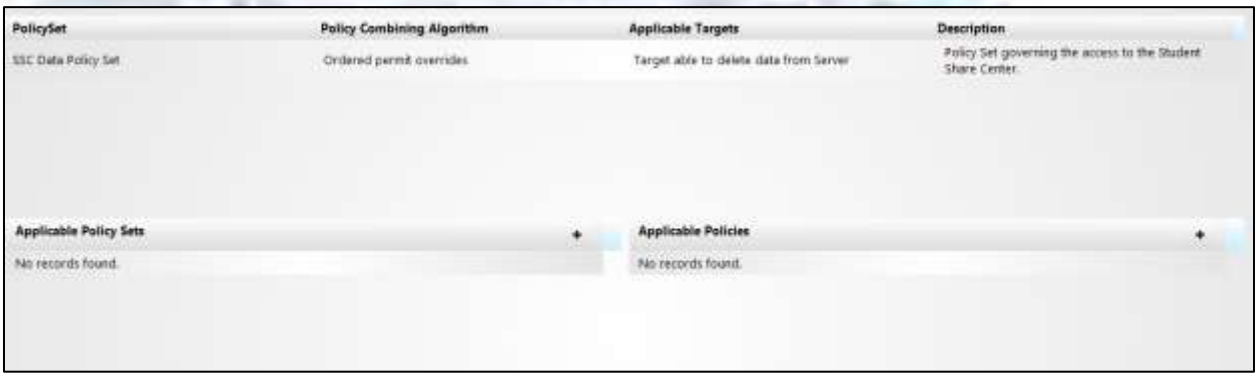
MPS - 3: Delete Policy Set

1. To **Delete** any of the existing Policy Set, right click on the **PolicySet** to be deleted and select **Delete** from the drop down.

2. Confirm the deletion by clicking on **Yes** in the confirmation delete dialog box.



3. After the successful deletion of selected Policy Set, updated list of available Policy Sets is displayed in the main **Policy Set** interface.



C. XACML Generation

This is the final section of this manual. In the following section, we have demonstrated the generation of XACML based **Policy** and **Policy Set.**

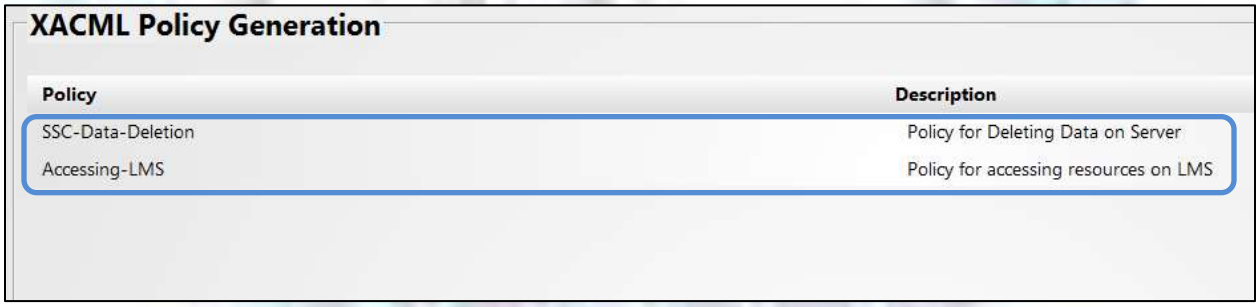
If we hover up cursor to the 'XACML Generation' a dropdown menu will appear showing two options **XACML Policy Generation** and **XACML Policy Set Generation**.

PG - 1. Policy Generation

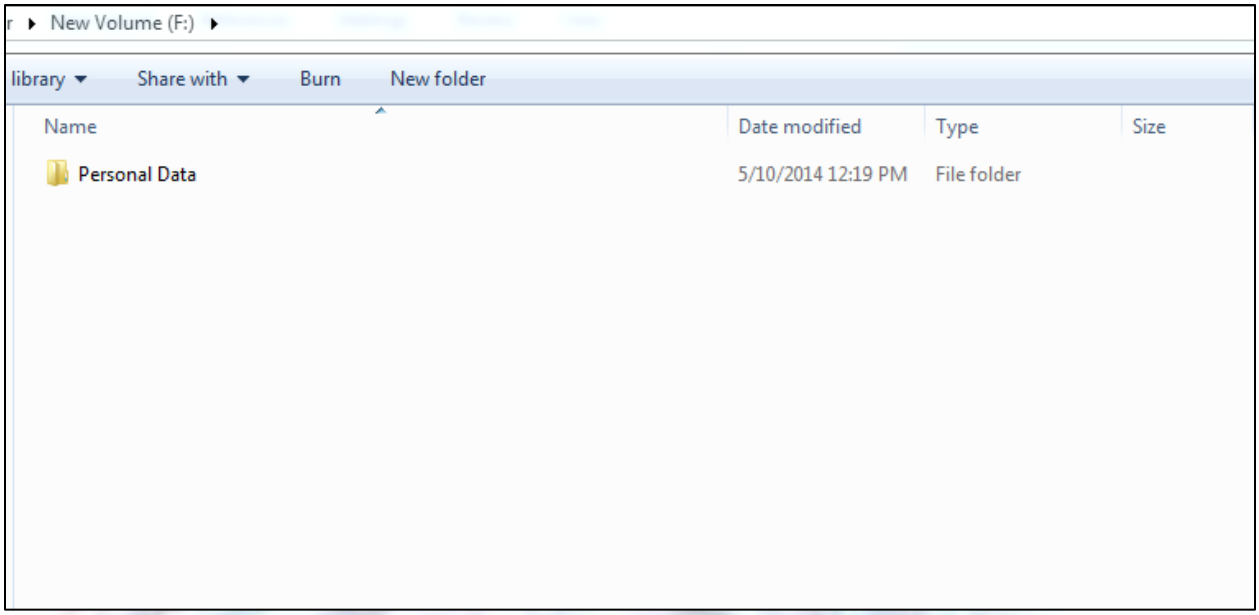
MPG-1: XACML Policy Generation

1. Click on **XACML Policy Generation**.

2. Initially, if there are no **Policies** in the database the message "*No records found*" is displayed, otherwise the Description of Policies is shown.



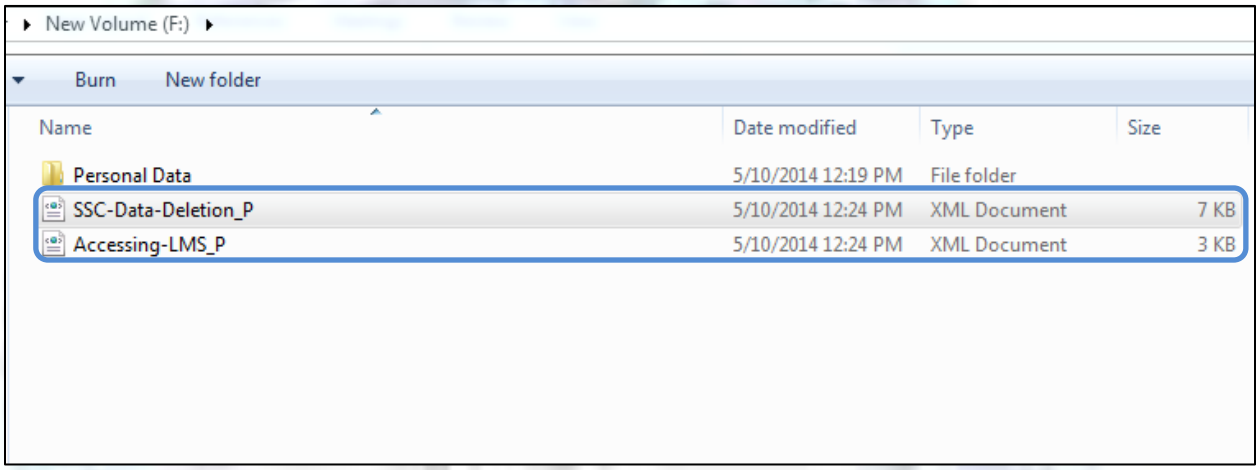
3. All the **policies** and **PolicySet** we will be generated in the **F:** drive. Right now we have not generated **policies** or **PolicySet** therefore; the drive **F:** is not showing any of it.



4. In the **XACML Generation** tab, click on the **Generate all XACML Policies** button to generate all policies.

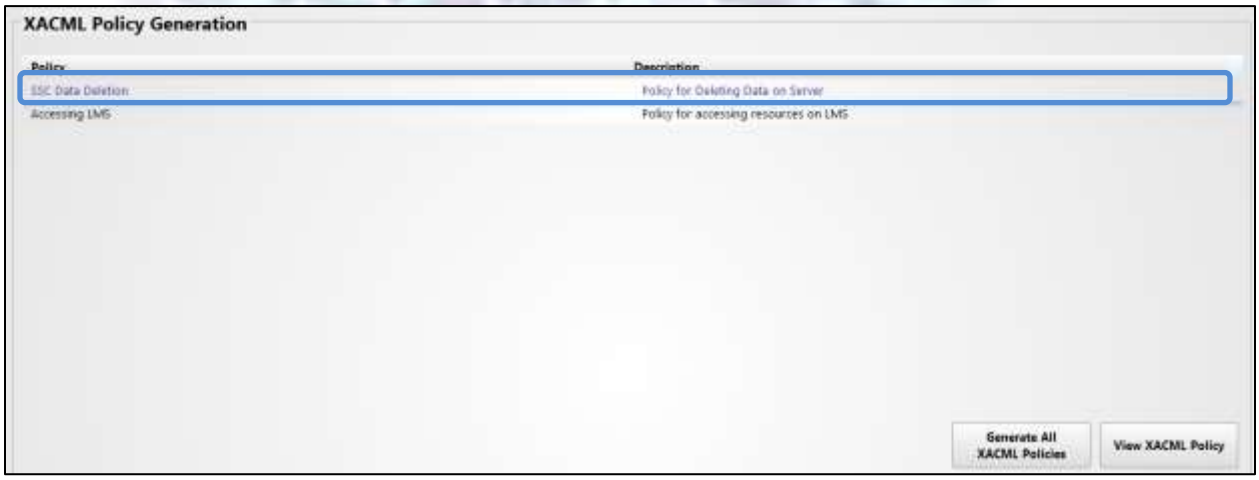
5. A dialog box will pop up showing that all Policies have been generated.

6. In the following figure we can see that our **F:** drive has the Policy files that are just been generated file.



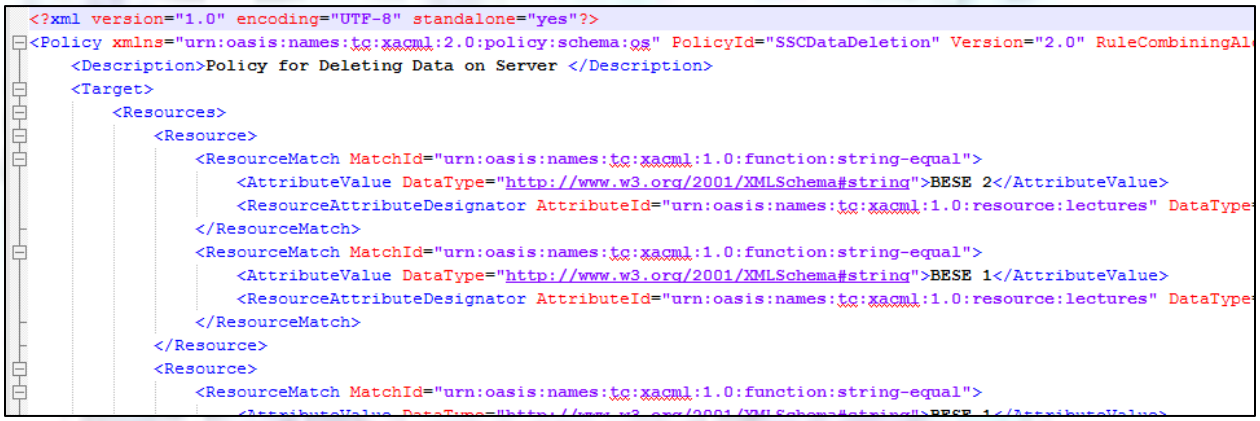
MPG-2:XACML Policy View:

1. For viewing any generated Policy, select the Policy.



2. Click on **View XACML Policy** button to view the Policy.

3. After clicking, the selected Policy will be opened in the default XML viewer:

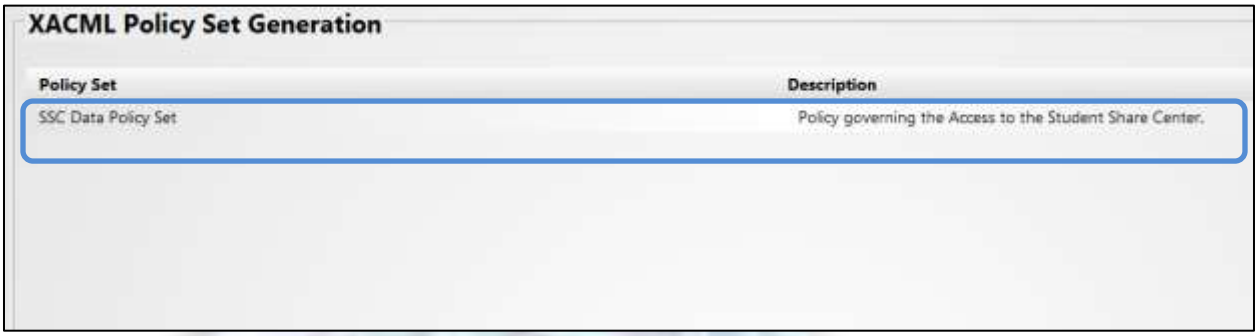


PG - 2. Policy Set Generation

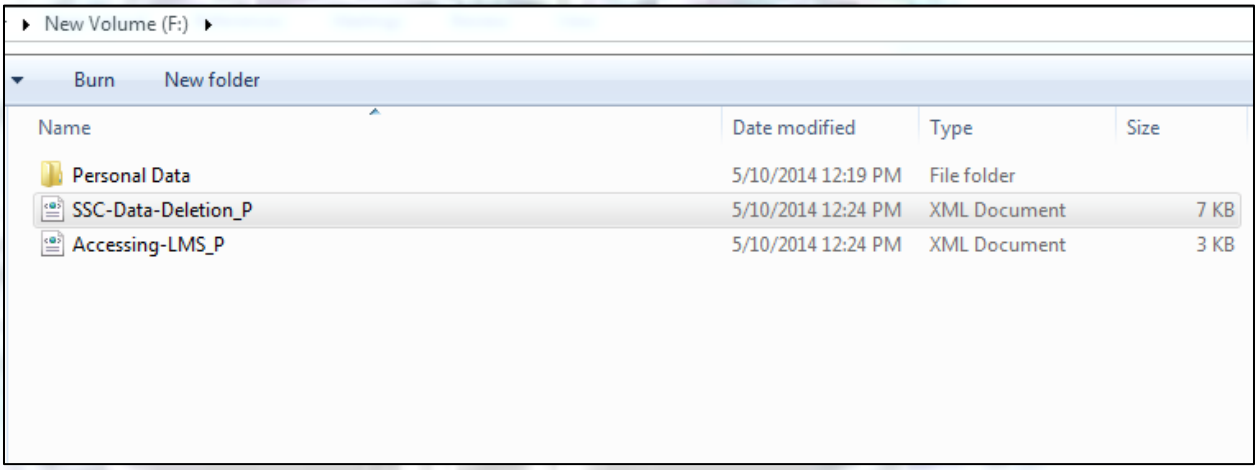
MPSG-1: XACML Policy Set Generation:

1. Click on **XACML Policy Set Generation**.

2. Initially, if there is no **Policy Set** in the database the message "*No records found*" is displayed, otherwise the Description of Policies is shown.


XACML Policy Set Generation
Policy Set
Description
SSC Data Policy Set
Policy governing the Access to the Student Share Center.

3. All the P**olicies** and **PolicySet** we will be generated in the **F:** drive. Right now we have not generated **policies** or **PolicySet** therefore; the drive **F:** is only showing generated Policies.

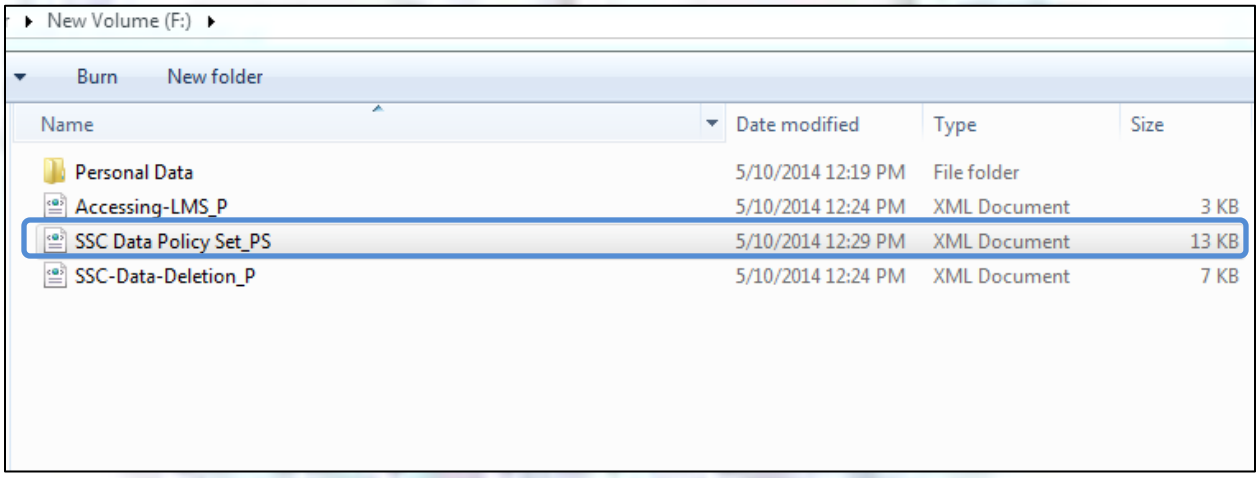


4. Click on the **Generate all XACML Policies** button to generate all policies.

5. A dialog box will pop up showing that all Policy Sets have been generated.

Cloud Access
All Policy Sets successfully generated!
XACML Policy Set Generation
Policy Set
Description
SSC Data Policy Set
Policy Set governing the access to the Student Share Center.

6. In the following snapshot, we can see that the newly generated Policy Sets is stored in the **F:** drive.



MPSG-2: XACML Policy Set View:

1. For viewing any generated Policy, select the Policy.

2. Click on **View XACML Policy Set** button to view the Policy.

3. After clicking, the selected Policy Set will be opened in the default XML viewer:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<PolicySet xmlns="urn:oasis:names:tc:xacml:2.0:policy:schema:os" PolicySetId="SSCDataPolicySet" Version="2.0" Policy
    <Target>
        <Resources>
            <Resource>
                <ResourceMatch MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
                    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">BESE 2</AttributeValue>
                    <ResourceAttributeDesignator AttributeId="urn:oasis:names:tc:xacml:1.0:resource:lectures" DataTy
                </ResourceMatch>
                <ResourceMatch MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
                    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">BESE 1</AttributeValue>
                    <ResourceAttributeDesignator AttributeId="urn:oasis:names:tc:xacml:1.0:resource:lectures" DataTy
                </ResourceMatch>
            </Resource>
            <Resource>
                <ResourceMatch MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
                    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">BESE 1</AttributeValue>
                    <ResourceAttributeDesignator AttributeId="urn:oasis:names:tc:xacml:1.0:resource:lectures" DataTy
                </ResourceMatch>
                <ResourceMatch MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
                    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">BESE 2</AttributeValue>
```